This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

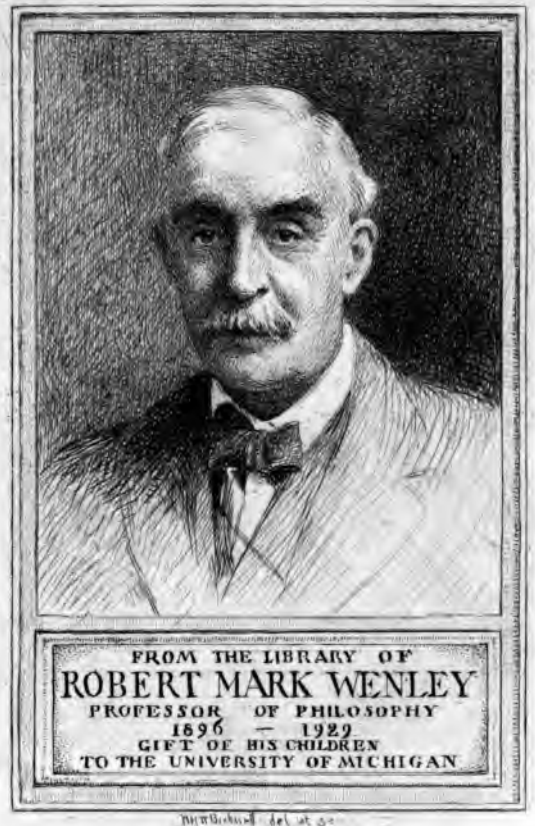
Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

BD
41
23

A 813,723

SPIRITUALITY OF CAUSATION

R. LAJMING



FROM THE LIBRARY OF
ROBERT MARK WENLEY
PROFESSOR OF PHILOSOPHY
1896 — 1929
GIFT OF HIS CHILDREN
TO THE UNIVERSITY OF MICHIGAN

LD
54
.L2

THE SPIRITUALITY OF CAUSATION

A SCIENTIFIC HYPOTHESIS.

BY

RICHARD LAMING.

AUTHOR OF "ORIGIN OF MATTER;" "GOD IN SECOND CAUSES;" ETC. ETC.

WILLIAMS AND NORGATE,
14, HENRIETTA STREET, COVENT GARDEN, LONDON;
AND 20, SOUTH FREDERICK STREET, EDINBURGH.
1874.

[*All rights reserved.*]

"The best tests of a scientific hypothesis are found in the simplicity of its conception and the universality of its application. If the solution of all observed phenomena is found in a plain proposition, unencumbered with provisoes and additions to meet special cases, the proposition proves itself."—"*Times*" *Leader*, *April* 15, 1874.

St. Wenley
3-17-39

INTRODUCTION.

THIS work, which I had intended to describe as a scientific Induction, is, like Franklin's happy surmise of the cause of lightning, sent forth under the designation of an Hypothesis; not that I perceive the superior appropriateness of the latter term; but rather because I would of all things avoid the imputation of an unjustifiable assurance to which the former term might in the opinion of a valued critical friend make me amenable. Possibly there are to be found many who will regard even the more modest term to be presumptuous; as, applied in its present connexion, it really raises the same question as the other; for while the one *indicates* that the Mind of Deity has actually been discovered in His work of creation, the other supposes such a discovery to be at least possible.

Hypothetical as the *spirituality of causation* once necessarily was in my estimation, I regard it now as an Induction; which it shows itself to be by the new phenomena it is continually bringing under its simple and comprehensive doctrines, without being itself susceptible of change, or needing in its detail exceptional expedients to fit its principles for any particular adaptation; those principles being few in number and every one of them fundamental: the hypothesis or induction, call it which we may, is not altered by its name; which our experience ought to be allowed to change. We make our phraseology obscure by calling the Induction of causation *from* Facts the Induction

of Facts; whereas it is the causation, not its induction, which points to whatever is new, and that not as Fact but as Truth by deduction.

My experience of spiritual causation, though occupying a life, may be summed up briefly, and it is this: perceiving, as I thought, that creation was a scientific work of mind I examined the suggestion by taking it up, as I now wish others to do, as a tentative hypothesis; and so I held it—as they too should hold it—until it had answered every demand I could in reason make upon it; when, finding it not to have fallen short in any particular, I could but regard it as demonstrated; that is to say, proved to point to the First Great Cause from a system of facts led to by a surmise—harmoniously related by induction—and finally, like sound conclusions in mathematics, proved to be based on truth by affording deductively all the natural events that could be required of it; so that even now by calling spiritual causation an hypothesis, I am perhaps unnecessarily submitting to have my confidence in the doctrine underrated.

From what I have now said will be perceived all I could have wished to convey by the title of the book; all that I purpose by addressing to the public the quotation at the back of the title-page; and all that I mean by adding to it the paraphrase with which I shall close this appeal: when "the solution of all observed phenomena is found in a plain proposition, unencumbered with provisoes and additions to meet special cases, the proposition," *though originally hypothetical, has become a proved logical induction.*

FLANSHAM. BOGNOR. SUSSEX.

November, 1874.

CONTENTS.

SECT.		PAGE
I.	Fundamental Principles briefly laid down	1
II.	The earliest information by fact of Universal Mental Causation	21
III.	Scope of Philosophy. Induction and Deduction equally necessary and promising	35
IV.	Attraction and consequent Motion of matter with variety in Velocity and Direction the only physical Effects of mental Causation and the essential characteristic of Second Causes	42
V.	Materialism in the place of Spiritual Causation	50
VI.	Natural Science the relation of created Physics to uncreated Metaphysics	61
VII.	The Infinities, volumetric and enduring, of Negative Space	67
VIII.	By Space we geometrically measure, directly or indirectly, all effects of a physical nature	72
IX.	Limited Physical Action delegated to creature minds with Responsibility for the Second Causes they originate	78
X.	Chaotic creation of matter in passive atoms from the nothingness of Space	82

SECT. PAGE

XI. Orderly Nature produced by comprehensible mental means from the passive Chaos 89

XII. Conformity of the Intensity of creative action to an abiding Necessity of Geometry . . . 95

XIII. Places of Atoms and their relations in the formation of Molecules 101

XIV. Physical Induction, its nature and operation on Electricity and probably on Light . . . 106

ERRATA.

Page 16, line 6, for "towards another" read "towards one another."

„ 44, line 6, for "opposed by" read "by opposing to it."

„ 45, line 16, omit "respectively" and read "by its several effects."

SPIRITUALITY OF CAUSATION.

First Section.

Fundamental Principles briefly laid down.

1. "From nothing comes nothing, but everything has its cause." Let the disciples of the old sage Democritus have this conceded, and it will not check us in proving that the material creation is the production of a God; and first of all the crude matter itself with a physico-geometrical nature, combining an always-old geometrical extension of space or nothingness in three directions, with a new solidity conceived and brought into being for the occasion, and by which it was made different and distinct from what it had been. Thus constituted matter would be chaotic and in every respect passive, having only solidity and volume for its attributes; its volume inherited and only its solidity a new existence.

2. As the earliest stage of creation no human conception can be more simple than such a solidification of the already everywhere-existing geometrical space; simplicity therefore commends this particular conception; and we may leave the simplicity to be justified by the comprehensiveness we shall be able to show logically belongs to it. On the other hand we can imagine but one kind of power adequate to effect this

solidification of space; and that is mind, or *intellect conscious of its own designs,*—something like our own mind in its action on the body associated with it,—but acting on all the space it is about to make into matter for its own purposes—a living or spiritual geometer capable of comparing spheres which to us are inconceivably minute, and possessing an automatic power effectually able to ordain that no two such spheres should ever even in part exist in the same place in space, or be otherwise than separately in exclusive possession of it. Thus disposed of, the minute spheres of empty nothingness would be passive atoms of matter, definite in volume, hard, unsusceptible of division, destitute of all other property or quality whatever, and such as being left alone we might conceive to remain in a state of chaotic existence for ever, none of them having any affection or sympathy for one another.

3. And against this what is there to be alleged? The maxim that out of nothing nothing can be derived will no longer serve any purpose of logical controversy. Minute spheres of empty space, call them by whatever name we may, are *nothing.* Our impervious atoms of matter are *still nothing.* Position establishes their character for impermeableness; to be impermeable is to be solid, and solid atoms of matter are everything that needs to be obtained *out of nothing* for creation by mind, though without active powers, or inherent forces, they would but ill serve the materialist. We shall want forces and laws; in *passive matter* there

are none; from mind we can have force and law; and the intellect and moral power of the Creator may have furnished laws to His own power, so far as He has not found *necessities* antecedent to Creation, like space, everlastingly ready at hand, and not to be uselessly put out of consideration by a reasoning power however great.

4. The assumption of a Creator for the production of chaotic matter in the manner indicated supplies the universe with a Geometer able to place small spheres of space in whatever relative positions he chooses them to occupy from time to time, *really*, just as we mentally conceive to be done in the geometrical exercises with which we occupy ourselves. We can imagine chaotic atoms to be determined under certain definite circumstances towards one another, making reciprocal approaches until they rest one against another in mutual contact; such approach being, not a power of attraction as we call it, but a compliant occupation of a succession of consecutive places, each carrying out the object to be accomplished by the motion, so as to consign the moving body ultimately to a point of the greatest possible proximity; and because there is such a power exercised by the Deity in a diversity of forms that we figuratively represent as attractions—that is to say with particular objects to be accomplished by suitable magnitudes of displayed energy—we shall in those mental energies be able to trace the phenomena and laws, not of creation only, but of nature altogether as they are exhibited to us throughout the universe.

5. In like manner the motion of matter, otherwise than away from a centre of force, and with a purpose of occupying places at successively greater distances in a right line from any given point upon it, will be called repulsion; merely to express the fact of the successive *greater* distances, precisely as in the former case attraction was used to express successively *smaller* distances from a point progressively approached.

6. However much or little this way of regarding causation may be understood, no one will be able to maintain that the physical forces—in the common acceptation of that compound expression, which associates cause with an activity in matter—is any other than a familiarized fiction. Science has lately made some discoveries, probably tolerably well known, though ostensibly ignored with a somewhat owlish blink, by which we are taught that the ruling force operating to produce the attractions of physical science is of a mental character; proclaiming itself to be so by evidences no one can gainsay unless prepared to maintain that force in matter can be conscious of design, as well as variable in amount for adjustment to a variable work,—thus making matter not only an animal by ascribing to it mind, but raising it to a mental dignity so far above that of the human mind as in some respects to be coeval with divinity by exceeding human capabilities. This we must now explain, first mentioning some inductions of facts that will be useful in making the truth intelligible.

7. Dr. Whewell has somewhere remarked that the

inductive talent is much less common among men of science than the deductive; were not that the case it is probable that heat and electricity would never have been translated from their old places as forms of matter to the higher dignity of unsolid physical forces, and handed over to the mathematicians as such at a time when neither force nor matter is satisfactorily understood. There seems to have been very little reason for the change, if we may judge from what has since been demonstrated concerning their proper place in nature. In this essay we still accept them in their old character, and connect them with light as archaic elements of matter, different from all other atoms in constituting molecules by combining together around one common centre. Each of the archaic atoms has its own special volume which was its distinguishing mark in chaos; an inequality that is afterwards indicated by variable circumstances attending their passage between molecules. From these circumstances it is deduced that throughout the whole of nature each atom of caloric is enveloped in an atmosphere of the atoms of light, while each atom of electricity attracts around it an atmosphere of the atoms of caloric, all with a force varying according to their diffusion in conformity with the geometrical law of greater diffusion with greater distance; and which we know mathematically must be as the squares of the respective distances, inversely. Under this old geometrical law all electrical atoms tend to equalize their temperatures, caloric being abstracted from one atom, which holds

it more feebly at a greater distance, by another atom attracting it more forcibly at a lesser distance; until the forces; and the distances; and, as a result, the temperatures become respectively equal. As a first passing evidence of this order in the mutual combination of the archael atoms for the formation of molecules, it may here be remarked that electricity can never be eliminated from them without bringing away caloric with it, and that great accumulations of caloric always give out light.

8. In like manner each molecular centre assembles around it with an intensity of force varying according to the same geometrical law, an atmosphere of electrical atoms, each one of them forming a centre to caloric, each atom of caloric itself surrounded by luminous matter. But there is no equalization of the electrical as of the calorific atmospheres; for the simple reason that under all circumstances the number of electrical atoms around a molecule is definite, each molecule having a number peculiar to itself, being its electrical, or, as commonly called, its chemical equivalent. We have had for years every evidence experimental and doctrinal that the equivalent confers on the molecule its weight by the tendency of the electrical atoms to approach each other, producing the phenomenon of universal gravitation; and from which, universal though it is said to be, the matter of heat, if not light also, is exempt; but only when unaccompanied by electricity, as we learn from observation.

9. If the electricity in molecules did become equally

distributed among them after the manner of caloric, there could of course be no molecular equivalents, which is one means out of several of knowing that gravitation as a force is minor to the electrical attraction which occasions chemical affinity; but the major of the two electrical attractions is peculiar in having its magnitude to vary with the electrum, or electrical matter, in a much higher ratio than the rule of simple proportion which we apply as an axiom in all other cases of cause and effect; for if we were to imagine that cause increases as the number of electrical atoms attracting the centre of their molecule, effect would vary as the square of its cause, and that would be the absurd conclusion we should have to believe with respect to every electrical experiment.

10. Here then we ask—what can be the force which has appointed attractions to electricity if it be not the mind of the Creator—who or what but a living power can make one and the same atom of electricity approach its molecular centre through any constant distance with a velocity, or attraction, varying as the numbers 1, 3, 5, 7, &c., as it may happen that 1, 2, 3, 4, &c. electrical atoms shall be under passage to the same molecule? We may be told this will some day be reconciled to the axiom; but the answer is evident: then will mental volition have issued a law it is waiting for undetermined circumstances to suggest.

11. A few reflections of which we are noticing the most prominent will serve to assure us that although *nature* is not entirely a mental production *creation* is

so altogether. The doctrine of creation, so far as we have proceeded with it, has given us matter out of nothing by mental force; while the matter, being chaotic and passive, is accordingly susceptible under a further action of mind of entering into orderly arrangements.

12. But creation we are prone to think has already taken place, at least so far as our world is concerned, once for all; we believe that all which the earth is and ever has been, has resulted from laws fixed by the Creator at one epoch and destined to serve for all time. There appears to be nothing overwhelmingly difficult in that consideration; but though, as geology informs us, terrestrial organisms continually become more perfect with later ages, it will be perceived that *the face of creation must be perpetually changing,* not because of any instability of the laws themselves, but on account of the ever-renewed conditions under which causes produce their effect. Such improvements, instead of rendering difficult creation by fixed laws are additional evidences of superlative wisdom which appoints simple and rigid exactitudes to be productive of consequences that provide for a change; for it is manifest that the operation of one and the same act of creation can not uniformly produce exactly the same theoretical result, because of changes in relative position which the materials operated on will have undergone by reason of the action immediately preceding any present one. This fact is made good use of by the author of the "Origin of Species," whose system it thus briefly summarizes:

Causation commences variety in effect with commencing variety in circumstances, or condition. Favourable circumstances conduce to greater effects of cause; and it may be also that greater physiological consequences take the place of, and are more enduring than, lesser ones; whence may have arisen 'the law of inheritance' and 'the struggle for existence,' both insisted on by Mr. Darwin. His 'natural selection' will be seen to be the predominance of the more, over the less, favourable circumstances under which cause has the opportunity of producing its effect: as for example, when two atoms of an electrical equivalent attract with greater magnitude one instead of two molecular centres; or attract half of each of the two at a shorter distance with increased intensity.

13. Henceforth we shall have to impute to matter no power of any kind; unless that passive obedience to the Creative Will which excludes from the same place in space all other things of a like kind, thereby making the space solid, be regarded as a power. We have already said that solid volume is the whole character of matter in its chaotic state; and that by it alone matter differs from space, or the nothing from which it was made. Now motion is the sole conceivable effect of force upon it; while rest is a condition which may result from all the forces which are in action upon matter at any particular time, being then balanced in all directions. To motion and its counterpart rest we therefore look for all the second causes and conditions of physical phenomena.

14. To the passive subjection of matter to commanding mental force, we ascribe its motions in space whenever motion is possible; the amount of motion at all times being the exact equivalent of the mental energy in exercise as the motive force for its production; the same equivalence of effect to cause being also countervailing the tendencies of matter to move, while held in a condition of forced rest, under which circumstances they cannot always be accurately appreciated.

15. Tendency to motion, whether movement becomes freely established or be more or less prevented by a balancing of forces, being invariably the first and immediate effect of mental causation acting on matter, is in consequence the earliest of second causes. And second causes succeeding each other in a continuous line, can accordingly vary only in the velocities either actual or due to them as coequals to their originating cause at the head of the line, however unequal their effects may be to one another. For example: if a cause will just suffice to remove four electrical atoms from as many molecules it would produce its full effect in removing half the number of electrical atoms from a single molecule, $1+3 = 1\times4$.

16. We continue to speak of the power of God in the material creation as physical causation, the misnomer indicating the end attained rather than the means active for its production. In like manner the disposal of material atoms by the Divine Will ordaining certain of them to approach or tend to approach

others,—each with its own special magnitude, and the existing intensity of force—determining, whenever free motion is practicable, a corresponding velocity of passage, we may also for convenience describe as the result of particular forces of physical attraction, depending on the explanation already given about the mental character of force for the expression not being misunderstood.

17. Here we should remark that as action takes place in cubic space, any force producing action, whatever be its magnitude, is always subject to the geometrical law as old as eternal space which needs to be in every case taken into consideration for determining the diffusions or comparative intensities with which expanding force will operate on matter in different positions relatively to that particular centre from which it is in any case supposed to spread in every direction, declining in effect in simple proportion as the diffusion becomes greater. The peculiarity of that eternal law of diffusion is to extend the field of action of every central force abroad in every direction and without limitation of distance; whether the force meets with anything to act upon, or not; and one consequence of it is that every divine mental energy, or physical attraction, must be conserved as it extends itself outwards, its intensity varying inversely as the square of the distance from the centre multiplied into its diffusion which is directly as that square, giving one uniform product.

18. We must not mistake the atoms for the molc-

cules of matter, nor the molecules for one another; for neither atoms nor molecules have a common volume; nevertheless molecular centres, when in a gaseous condition, surround themselves to so great and equal an extent with caloric that part of each of their volumes which is occupied by electricity, not being available for the new lodgement, occasions this remarkable result: namely, that the molecular weights multiplied into the molecular specific heats always give a product which is relatively uniform. The attractions in exercise upon the atoms of matter generally have the effect of combining one kind of atoms with another kind; but in one case electrical atoms combine among themselves thereby constituting the attraction of universal gravitation: thus supplying a cause for which we have been questioning science for centuries.

19. By its distinguishing characteristic—solidity, unconscious matter differs from conscious mind, and quite as much from other metaphysical things of an unconscious nature; and for showing how solid matter may have been created out of an abounding space wherein was nothing but spiritual or metaphysical existences, which, having no solidity, do not exclusively occupy any part of it, we begin by assuming the existence in space of an entirely mental person, or conscious power capable of achieving by mere volition any design he may have formed; provided only such design be not incompatible in any way with the inexorable necessities which must be conceded to have ever been for all duration, whether of time or eternity; and the view

we are taking of which greatly facilitates the creative process.

20. Such a system of nature, creative and pre-creative, has the importance of reducing speculative assumption to very small dimensions. In the first place it is less complicated to create by the direct action of mental power than by forces first created by that mental power for the purpose of afterwards themselves creating; while the only purpose we can conceive to be answered by the round-about substitution would be served by instituting under permanent laws the several attractions, and appointing them to a never-ceasing operation. And with respect to the eternality we are ascribing to space, it is manifestly more satisfactory to regard space as pre-existing of necessity as nothing, than as coming into existence as a nullity at the instance of a power however great.

21. As a doctrine the eternality of necessity seems to be devoid of all speculation; whether estimated by believers in theocracy, or advocates of atheism; for it implies no assumption needing to be proved, as in its own nature it is self-evident; take for example the metaphysical realities of geometrical quantity whether expressed in terms of measure or number, or we might say even the truths which distinguish the antagonisms of ethics and morality: these all need no proof whatever.

22. For proof of the creation from nothing by mental power in presence of the inevitable necessity we bring forward for its foundations, we shall eventually make appeal to the demonstrated efficiency of the doctrines

furnished by the inductions to be adduced; but now, while we have yet not proceeded so far, and are only entering upon the subject, we may find encouragement by reflecting on the experience we have of the causative power of our own minds; from which it is evident that while we are not creators in the sense of appointing space to be solid, or of determining what atoms made of space shall assemble together, we derive from mental action all our physical activities; and that fact furnishes us at least with some approach to an analogy, in place of leaving us to derive our *a priori* arguments altogether from speculative invention.

23. In past times the world has deluded itself by supposing the phenomena of nature to be due to forces appertaining in an unaccountable manner to passive matter; each force, though acting with others, giving its character to some branch of science. Thus we hear of forces of gravity, affinity, cohesion, electricity, magnetism, light, heat, &c., all which we classify under the designation physical force, by which name we profess to distinguish them as a class from mental cause which we have only admitted to have command over mind, or spirit. The present system repudiates all differences in the nature of force, regarding it invariably as a directly mental operation, varying in the magnitude of its energy and its subject matter for the purpose of effecting particular ends.

24. When any mental force, whatever its magnitude and operation, is being transmitted onward in a line of second causes, each equal to it, we have explained that

allowance needs to be made for variations in intensity as altered by distance and consequent distribution of action: a principle on which the effect of force ceases only when it *no longer has work to do,* though it seems to cease when the intensity is so reduced as to have become insensible. In truth causative energy is never expended; it achieves the work it finds to do, and all being accomplished still exists in its pristine excellence, except that its intensity is diminished in conformity to its own self-imposed geometrical law until the loneliness of vacuity is reached where further work is out of question. Physics so far differs from mechanics that while both sciences implicate the same mental forces, the latter treats only of those balances which the former disregards, except so far as they happen to be involved in the phenomena of nature. Physics need not concern itself with the surplusage of force, but mechanics does so, and that alone discriminates between them; for in all else they are one.

25. The term physical force, as designating causation, must in strictness be regarded as a misnomer; and, if conventionally tolerated for its habitual use and convenience, it should be restricted to cause when having some action on matter which is of a nature to become an object of physical, or sensuous, observation, and therefore of mathematical calculation; because physical observations accurately made, all admit of comparison one with another, both in respect to time and place, or in other words to duration and motion.

26. Abandoning the universal materialistic plan of

assigning active powers to matter, whose sole qualification, as an element in creation, consists in an exclusive occupation of place, we impute to it only a physically negative, or grammatically passive suffering of the Divine Will, disposing its atoms, or minute parts, to be moved towards another until they arrive in such absolute contact as the spherical form admits of, in conformity to willed magnitudes of mental energy, each magnitude operating with an intensity determined by relative position; the magnitude and the intensity together in each case making up a sum which is in truth the mental energy in operation at a particular place; although we speak of it as the physical attraction. Now the effective velocities equal to the causation—magnitude and intensity together—may either act with, or in opposition to one another; constituting what we are accustomed to speak of as *actions and reactions*, all which consequently are functions of mind and not of matter.

27. So much for first, or direct, mental cause; and which, having acted to produce incipient motion as an instantaneous consequence commensurate with the energy put into operation, is not to be regarded as force expended; but as still to be equally active throughout all subsequent duration, so long as any matter requires for the preservation of creation to be kept, or put, in motion; or any opposing motion requires to be counteracted, thus establishing those lines of correlative second causes which we observe to be in operation by the appearance of phenomena indicating

a change in the place of matter with respect to change in time.

28. The Divine mind, being everywhere and always present in space, whether the space be made solid by creation, or existing in its primitive nothingness, cannot be limited to matter as its field of force; even though its actions on matter are, as now assumed to be, in the lines joining atoms by the shortest distances. The mind which is omnipresent can act anywhere; and we must presume does act everywhere that it finds any matter to command: overstepping vacuity for the purpose, being even present to do so in the far off realms of space yet unknown to creation, where the rapidly ceasing, but never expired, intensities of causative volition still continue their now extremely diffused operations.

29. We can understand the limitation of matter to which every one assents, both as to its preparation as a chaos and its subjection to a superlative intellect; not so however the scholastic conservation of energy involved in the government of matter and made so familiar to modern ears. That the energy must be ever the same for each individual act of causation after due allowance for every varying intensity by its diffusion or concentration is understandable enough, and we have propounded it notwithstanding its variable effects; but the doctrine of conservation involves more than that, and asserts that the total quantity of energy, like the total quantity of matter it acts upon, amounts at all times and under all circumstances to an

invariable sum. We cannot perceive how such a necessity can justly be imputed to the free exercise of mind; and that it is imputed unjustly we learn by the facts of electricity which we observe to reduce the sum of electrical energies very manifestly on the separation from one another of the electrical actions.

30. Popularly considered the mere conditions, or circumstances, which are of absolute necessity in actions take rank as second causes; and the practice on superficial reasoning seems justifiable, the actions without the conditions being impossible. But the reasoning is illusory; space is such a condition, for without a volume of immaterial nothingness to move in, no matter, occupying volume as all matter does, could possibly be put into motion, or even be made to exist by any power however great; and it would be nothing better than a conventional mistake to speak of space as a cause of motion when it is itself only an absence of all positive realities; or for us to make any such conditions part of a causation while professing to be logical would be manifestly absurd.

31. In like manner the laws of nature, of which we hear so much without troubling ourselves to know exactly what is meant by the expression, can only be in reality the ordinances directly issued by the divine mind for the government of matter, while having reference for the modification of their effects to the circumstances and the eternal necessities which are to them as conditions; but it is quite evident that we extend the term law to include the conditions also under

which the laws are brought into operation. A notable example of this mistake may be instanced with reference to the law of intensities: as cause and its immediate consequence are supposed to be equal to one another any proportional part of the one will be equal also to the same proportion of the other, so that the intensity of a given force with its effect may be truly said to vary inversely with the distribution of the action. Now the distribution, or we may say the dilution, of force, gravitation for example, expanding around a centre is as the square of the distance from the centre at which the geometrical surface is measured; and hence it is held to be a law of nature that intensity varies inversely as the square of the distance at which the force is operating: a condition being in this instance mistaken for an actual cause. Theory demands for its own true conception that conditions be no more mistaken for the laws of nature than they can philosophically be for its causes.

32. Inasmuch as the now submitted system of nature is derived by inductive reasoning from premisses some of which may be deemed as of unknown certainty, it must be held to be speculative until, by affording conclusions assimilated to the whole range of natural phenomena, it shall have become physically demonstrated. But as such a demonstration could not, on account of its extent and diversity, be ever fully completed; we must be content with demonstrating only its fundamental principles, and opening up the long vista which leads to the vestibule of nature without

leaving the way obstructed against the progress of reason in any part of the explanation, until it ends in conviction. That is what we are undertaking.

33. The author, notwithstanding the success to which he believes he has attained, takes this occasion to regret the privacy which has for more than half a century marked his researches into this abstruse subject; and but for which he might have been helped by sympathizing compeers, instead of having now, at the moment almost of bidding science a final farewell, to plead with them for a candid review of his labours. He cannot make known the pains he has taken to acquaint himself with the subject to which his life was very early devoted: but he can and may be permitted to ask his readers to recollect that while the new doctrines he is desirous of propagating profess to go far towards a goal never before reached, they proceed on principles so definable and exact as to admit of easy disproof if so be that they are susceptible of being disproved at all.

34. He would close this introductory section by remarking that if the authoritative quotation we have began with cannot be called in question, it will follow either that some fact perfectly observed under known conditions must be particularized as being incompatible with the theory herein sought to be established, or the system in fairness acknowledged as having its claim to truth resting upon the foundations of nature; and on that test he places his confidence.

Second Section.

The earliest information by fact of universal mental causation.

35. We, as animals consisting of body and mind, and distinguishing knowledge from belief, learn truths concerning matter by first observing by our organs of sense the physical impressions made on them by material phenomena, or physical facts; and then immediately perceiving by the conscious mind in charge of the bodily organization that such impressions have been made and surrendered to its intelligence to be dealt with. This part of our education we call experience, but, beside the knowledge thus acquired by observation, each individual mind finds itself in possession of other truths by simply reflecting on the intuitions implanted in it by mental powers* capable of inspiring

* Sense observes and mind perceives: Bishop Butler writing his 'Analogy' went too far when he said "our organised bodies are no more a part of ourselves than any other matter around us." The last 'British Association' address successfully combatted that assertion by really showing that our consciousness, which we regard as mental, is derived through material impressions on the brain; but was itself at the same time illogical in requiring mind to perceive an impression when the brain has not received one. That the perceptive power is in the mind is proved by its ever perceiving morbid impressions made on the brain in cerebral disease. Consciousness is the perception by the mind of the true condition of the brain; which the mind must always perceive, whether it be normal or abnormal, rich with accumulated experiences, or with all razed from it by reason of material derangement, as when compressed, or diseased, while the mind has not yet been dismissed from remaining in connexion.

them as elements of education to be received as gratuitous gifts and simply by an act of reflection.

36. Reasoning, whether inductive or deductive, makes use indiscriminately of both kinds of knowledge as premisses for logical argument, with a full assurance that the conclusion to be arrived at must needs be wholly true, *provided only the premisses be themselves free from error.* Induction, however, for want of sure premisses is often faulty, and fails to exhaust the resources of inquisitorial science because the facts of observation frequently involve *conditions* which, being mistaken for *causation,* lead to their adoption as premisses when they are unfit to be so used; while, on the other hand, facts are sometimes so obscured by conditions as to be rejected as premisses for which important position their truth fully qualifies them.

37. Were we never thus misled by premisses when enquiring the nature of causation, we should, by induction, soon exhaust all the resources of science for its discovery and afterward be introduced by it logically into the full fruition of physical knowledge. And the practical lesson we should now be taught by that assurance is, even at the cost of creeping where we might wish to run, to take care, at every step of our progress, never to use among the premisses for an inductive argument any more than for a deductive one, a probability, however great, in the place of what we can absolutely know to be true. It is to inference more or less probable, and not to fair induction, that we owe the mystifications in which science is involving

us. With attention to the use we make of properly selected premisses there is no reason why induction should be less certain than deduction, or result otherwise than in demonstration. In reality they do both involve demonstration alike when based only on measure and number. Whenever reason cannot progress surely it would be better to go back and take a new argument that will intrude nothing doubtful in the course of it; and in the present theory of nature the author has had to do so time after time before he was able to adopt the unbroken line of consequences which has culminated in the success of his inquiries.

38. While keeping up the distinction we have noticed between observation by sense, and perception by mind; we shall need to refer even our corporeal appetites, or physiological functions, to physical conditions of which the mind is made perceptive in some manner no better understood than the production of its other perceptions; the whole physiological machine being in reality one entire organ of sensation, composed of elementary parts, each exercising a particular function of its own.

39. The derivative education arriving in our minds through the testimony of any other mind has not the importance of intuition which is directly personal; and no induction based upon truth thus indirectly imparted can afford a conclusion equivalent to certainty. It is therefore only through personal inspiration, or direct intuition that any mind can become assured of the truth of the derivative information found by it recorded

as the inspirations in others who have written what we regard as the Holy Scriptures.

40. We take up our argument, then, as having shown that just as it is impossible to be sure of the truth of a conclusion derived from premisses in which uncertainty is an element; so also it is equally certain that true premisses can by no possibility lead the correct reasoner to a conclusion which is not absolutely true. Why then, truth being the logical offspring only of indubitable premisses, did our scientific predecessors in their haste to learn the secrets of material nature admit into their inductive reasoning uncertain speculation? In their first setting out to discover the nature of causation, whether under the Aristotelian method or the later one advocated by Bacon, why as logicians did they all in common assume a force acting *in*, as well as *on*, matter—belonging to it, as well as commanding it? In ignorance of the origin and nature of matter, as well as of what is called physical force, a prudent reserve on both subjects might have served the purposes of science better; affording, as it would at least have done, an opportunity for the induction of causation to become in time better founded. It could not have been forgotten that minds existed as well as matter; and we have never yet been informed why the latter of those things should have been selected in preference to the former without an appeal to experiment for making clear all it could reveal in favour of mind.

41. But experiment seemed so hard to be devised that Bacon himself would probably have despaired of

its successful intervention in favour of the causation by mind; and as the action of matter was a fact that could not be doubted, while the distinction of the *in* and the *out* was a subject for the vaguest speculation, all appeal seems to have been waived by common consent, and inherent forces tacitly assumed as an easy, if not a correct, way out of the difficulty. Mental cause being thus dismissed from consideration, was soon so effectually ignored that an assumption was adopted excluding cause from every place where matter was not; a conclusion palpably inapplicable in the case of mental causation and eminently mischievous if untrue. In that day philosophers, with only indistinct physical principles to guide them, took a leap in the dark, falling into the mire of materialism, where we are all wallowing with them while arrogating to ourselves the distinction of being more than ordinarily rational.

42. We propose now, in determining the character of causation, to show that the investigation of natural principles may be made so much more productive and satisfactory than it has been as to make it clear that our predecessors parted company with nature immediately after setting out professedly under her guidance; thus leaving us a practical warning not to fall again into the same error. In making a retrospect of certain electrical observations which for years had refused to be submissive to the popular notions of that science we found perpetually recurring indications of the activity of a governing mind in unmistakable evidences of conscious knowledge and will respecting it,

accompanied with the exercise of power; the two former of which we must admit to be attributes of mind, or spirit, only; nor can we, after such a perception, profess to be guided by reason if we remain materialistic enough to impute power to the matter considered by philosophers in all historic ages and countries to be passive and inert.

43. As the conditions of a fact, or even a whole class of facts, may not all be known, while we imagine ourselves to be well acquainted with them; induction can seldom be so conclusive as deduction, which usually leaves none of the conditions of its premisses to the smallest extent doubtful; but an induction, notwithstanding, will be known to have all the conclusiveness of demonstration if it have proved sufficient for its purpose independently of qualifying conditions. The experimental inductions to which we are now reverting are of that character; and it is by such means, made widely general, that we hope to demonstrate the mental creation of matter and its motions in the structure and regulation of the universe.

44. We should perhaps have anticipated, or at least been prepared for, the discovery of such an operation of mental power over universal matter, had we duly reflected on the parallelism which is subordinately exhibited in the personal kingdom of each of us; wherein the human mind, as a derivative power, acts to a limited extent, ruling the material body over which it has a subordinate charge. Had we profoundly reflected on that delegated power of all animal mind over

matter, restricted as it is, and ill understood as we admit it to be, it would have served to suspend our assumption of active powers in matter; and might even have made us seek, with an expectation of finding conclusive evidences of the nature of universal cause; instead of venturing so unwarrantably as we have done to frame the imaginary system which has only added prejudice to our other obstacles, and threatens to make it insuperable for perhaps a long time to come.

45. The experiments which have ultimately given us by the philosophical process of logical induction the production of matter, as well as the universal government of creation, by mind, were brought before the public by Harris in the Philosophical Transactions for 1834. Up to that time the nature of electricity had been freely speculated on, even its material solidity being questioned; though what was then, and still is, referred to electricity as a force somehow or other ascribable to it and certainly unknown except in its presence, had been from the first regarded as of the highest interest, becoming still more important when Coulomb gave to it a mathematical character by experimentally proving that its action in the atmosphere across unequal distances varied in the ratio of the inverse squares of their lengths.

46. To that information the experiments of Harris, above referred to, added something all the more important to science for being entirely new and corrective of a notable oversight which Coulomb and all his

immediate successors had made in experimenting on electricity;—an omission which needed to be supplied before the force associating that particular kind of matter with the other kinds for the formation of ordinary molecules could be made out to be subject to a certain one of the important axioms of physical philosophy. This must now be explained.

47. Without stopping to discuss here the nature of electricity, we may say of it, without fear of introducing difference of opinion, that it is susceptible of division practically into aliquot parts. Harris, whose manipulation the author had the privilege of witnessing, has shown us by his example how to achieve that division with great exactitude; and he subsequently discovered and told us that the same thing had been done satisfactorily well by Cavendish towards the end of the past century. The correctness of the experiments of both those electricians may be assumed not only because of their habitual care in operating, but perhaps as much from an entire freedom of predilection for any particular conclusion; the latter experimentalist having refrained altogether from publishing his notes, while the former in making his results public virtually repudiated them for their novelty by attempting to reason away their indications altogether; and which twenty years later he did again, this time making his legacy to us of the little work *Rudimentary Electricity* more incomprehensible, than the science was ever before represented to be by any one writing upon its theory. The present author studying Harris' experiments as a critic could

not but perceive the correction which loomed from them on the unsatisfactory condition of physical theory; he verified them and carefully diversified them, until, satisfied that their results were consistently uniform, he had adopted the new induction of mental causation, which he has since applied so widely and harmoniously that he can no longer consider it as needing anything more than its universal demonstration.

48. An axiom already alluded to would teach us, with respect to forces acting on any kind of matter, that for all the actions to be equal the quantities of matter and the maguitudes of the force need to be proportionate —all attendant circumstances being in every respect the same. But the experiments of Harris, and the earlier one he has cited from the manuscripts of Cavendish show us that there is no simple proportion between the matter of electricity, or electricity whatever its nature be, and the force required to combine it in molecules, and to separate it from them in order that it may be, when detached, put separately in motion. Now, we certainly know nothing about mental energy that should make it uniformly constant under varying circumstances; but it would be easy to show as we proceed, that if cause in the case of electricity were as little productive of effect as to be simply proportionate, the whole face of nature must, as a consequence, be ever in violent commotion until brought to an end: in short, nature as we know it would be an impossibility. We are now not speaking of the intensity of the electrical causation: that, as Coulomb found, has, like all

other intensities varying inversely with the diffusion of action in cubic space, an uniform law of variation; but we speak particularly of the electrical magnitudes, until now unknown, and which we have discovered to have a ratio for their variation quite independent of distance.

49. The electrical magnitudes of attraction now under particular consideration vary directly as the squares of the quantities of electricity which they combine with each molecular centre, and which admit of estimation with mathematical exactitude; only needing for that purpose that the electricity under action be numerically divided into small equal parts. To that end we treat electricity as matter occupying space; and being material, as composed of atoms assembled by attraction around each molecular centre in some definite number denoted by its weight and constituting what we know as its chemical equivalent. We assume it to be a true induction from observation that the attraction acting between each of the several electrical atoms and its molecular centre varies in *intensity* according to Coulomb's law of the squares of the distances, and that it has a *magnitude of force* varying as the square of the total number of electrical atoms associated with it around the same common centre; from which it follows—intensity being left out of the calculation—that if any number of electrical atoms required to have their total molecular persistence calculated; or if we required to know by what force acting in an opposite direction their combination with the molecular centre might be just balanced, it

would be arrived at mathematically by squaring that particular number.

50. This variation in the magnitudes of the ordinary electrical attraction is widely different from the strictly proportionate result insisted on by the axiom, which points to constant magnitudes of causation as acting throughout every line of second causes; so that the departure from uniformity in the case of the electrical magnitudes is only to be explained by concluding that wherever any change occurs in a line of electrical causes and effects something conscious of will, and authoritative by power, must be operating to cause it. That something can only be the creative mind; and to that we are now imputing all effects whether electrical, or otherwise, whether immediate or secondary, put into operation by the Architect and Builder of the universe to perpetuate themselves in unbroken sequence for establishing uniformity in nature.

51. Now in perfect consistency with this theory of magnitudes—as suggested by the experiments of Harris, following that of Cavendish, and more lately confirmed by the writer's own experience—we set apart the law of Coulomb as having application only to the intensities as they result from the geometrical distribution of the field of action, and which there is reason to believe applies in the cases of all forces without exception, let their respective magnitudes whether constant or variable, be whatever they may. In the experiments from which we have derived the law of variable electrical magnitudes it has always been found

however great or small the intensities might happen to be, that intensity might be put out of consideration without vitiating the result; for it was invariably the case that three parts of electricity acted upon together approached a given mass of molecules with a total force of nine instead of the axiomatic three; four parts of electricity under the same circumstances with a force of sixteen instead of four; two parts with a force of four instead of two; and in like manner for all other numbers so far as experiment could be extended for the demonstration either by analysis or synthesis.

52. And another fact in corroboration may be here appended: electrical intensities by Coulomb's law vary as the inverse squares of the distances, quantity having no effect in changing it; and the magnitudes of electrical attraction vary as the squares of the quantities of electricity directly. Now, by compounding the intensities with the magnitudes we theoretically get this result, namely, that whenever the quantities of electricity and the distances vary together the attraction is a constant sum, and the same is observed to be the truth when ascertained by experiment. This peculiar confirmation of the variable electrical magnitudes, while electrical intensities are observant of the law of geometrical diffusion explains the fact of the sun's plus electrical induction reaching so far as through the earth's atmosphere; which we find as we should expect in a permanently electrical positive condition never otherwise circumstantially accounted for.

53. We shall theoretically perceive as we proceed onward that to deprive a molecule of the whole of its electricity would be to make it imponderable; just as we now find practically that to disturb its electrical equivalent is to interfere with its chemistry. When those results come to be fully understood it will be perceived that no other argument need be sought for in justification of the wisdom which has appointed the withdrawal of electricity from the molecules of matter to become difficult in a high ratio with the measure of its achievement; all which we shall the more clearly perceive if we take occasion to apply the doctrine of variable electrical magnitudes to the common phenomena of electrical excitation and accumulation, especially with relation to the sun's physical condition and induction, as influencing our atmospherical disturbances by its plus electrical charge.

54. Except by ascribing variable electrical magnitudes to the direct influence of mental will there is no way of explaining what our senses observe in these experiments of Cavendish and Harris. When two parts of electricity are approaching a centre of force under the action of the so-called electrical attraction, the power is four times greater than when the quantity of electricity is only half as great; how does the companionship of the other half of the electricity cause so great a difference? If the axiom of equality applied to the case we should understand from a doubled cause a doubling of the effect invariably, and not in the case of the compounding of the laws only; but

not that the effect should without the composition become quadrupled. One of two things must have resulted from the doubling of the electricity: either the active power has doubled for each of its halves, or trebled itself for one of its halves while remaining unchanged for the other; but whichever alternative we may adopt the axiom of simple proportion will have missed in its application. It is absolutely inconceivable that companionship in action should influence unconscious forces; and thence we can only conclude that what we call physical force is truly in this, and if in this then also in every, case a conscious power, or mental volition competent to select any magnitude for its own effect under any particular circumstances.

55. Cavendish's original experiment, under the many diversifications we have above referred to, reproduced the same truth of variable electrical magnitudes by such a multiplicity of inductions, without affording any to cast a single doubt upon the one uniform conclusion; that, when we consider—unexpected as the discovery was—that it has since thrown an entirely new and unparalleled light upon the dark mysteries of physics, it can no longer be fairly concealed that human science has declared all causation to be mental in its character: a conclusion that may for a time longer be ignored, but never in future logically contested, and that electricians in particular should take immediate advantage of for regenerating their much neglected science. Were the force with which an electrical equivalent is combined in a molecule proportionately

great for all its parts the endurance of the world would be a matter of chance if not of the whole universe.

Third Section.

Scope of philosophy. Induction and deduction equally necessary and promising.

56. Philosophic truth, if wholly written, would comprise all mental experiences whether of the Creator concerning us, or of us his conscious creatures respecting Himself; narrating all that is, and happens, in the universe, with the reciprocal relations of all its parts. And though to approach even distantly in the faintest outline to what is so encyclopedic is far beyond achievement, still whatever system of nature may be offered professing to be fundamentally based on truth must be at least susceptible of such extension, opening up to contemplation principles which reason shall without hesitation pronounce adequate for establishing the whole colossal work of creation, and of relating it in a satisfactory manner with all that must have been before it in the shape of mathematical and we may suppose also of ethical necessities as they must have existed for a foundation in eternity itself; for without them no such world as we are acquainted with could possibly have been formed.

57. Of so universal a philosophy the portion we denominate Physics, or the action of mind upon matter

in space, changes the positions of the parts of the matter with relation to one another with a velocity of motion corresponding to the Will, or mental energy put forth in producing it. Thus is given to every part a seeming attraction for other parts, which attraction materialism imputes to matter as its inherent property or quality, not content to regard it in its true character of passivity and inertness. As the motion of matter is susceptible of no other variety than difference in direction and velocity of movement, so to such differences accepting them as the alphabet of physics, we have to trace all the beginnings of science, finding in them the rudiments of its language with nothing wanting to complete either the prose or the poetry of the material world.

58. Natural philosophy as a whole embraces in its scope all that man knows or can learn about creation; and to some extent also about creation's antecedents, namely the *necessary* realities of existence, not of time only but as well of a past eternity. And his means of knowing are intuition, which to him is gratuitously given simply on reflection; and his own labour of investigation by Induction or Deduction; or reasoning from effect to cause or in the opposite direction from cause to consequence, respectively known in the schools as the *a posteriori* and the *a priori* methods of argument.

59. By intuition we know all necessary truth: that is to say all truth that we must know to preserve ourselves in existence anteriorly to experience and our race after us; as well as those truths which in their

very nature cannot be regarded as problematical, such as—that in the absence of everything there can only be nothing; that empty space as nothing must be infinite in its length, breadth and thickness, or volume; that as no event happens without a cause it is reasonable to impute any increased magnitude of effect to a greater operation of cause; that the operation of cause, as unmeasurable mind, can only be estimated by its consequences; and that as all effects of cause acting on matter are related to space they can be measured directly or indirectly by it. Demonstrations are truths all sooner or later perceived intuitively to be necessary, whether they be physical, or mathematical; logical reasoning in either case relating conclusions to true premisses whether they be few or many, and showing the final conclusion to be inevitable; thus making the argument differ from mere deduction which often passes falsely for demonstration, if based on premisses only supposed to be true.

60. We sometimes reject true inductions when they conflict with our previous notions, as was the case with Cavendish and Harris already referred to; and at other times we apply the conclusions of Induction deductively doing mischief by perpetuating and extending an existing error. In this way science is now affecting to have demonstrated not only truths, physical and mathematical, obtained as in either case they only can be from absolutely indubitable premisses, but most palpable speculations which at least are uncertain, and proclaimed by the present reasoning to be absolutely

unworthy of confidence; such, for example, as that illimitable space is not an empty nothing in any place but everywhere a plenum of matter, because forsooth certain theories concerning the action of light can only be supported on such a supposition; and that space can be made geometrically greater by measuring it linearly in five rather than in only three directions—a supposition found to be necessary to the promulgation of a certain new theory of heat; and, again, that the law of Coulomb measures the forces uniting electricity to molecular centres for all quantities alike though the magnitudes of those forces are incessantly varying while the intensities only are measured.

61. It is impossible for the inductive philosopher whom these abuses of deduction most concern, to contemplate them without entering his protest against their extension by the mathematician, who seldom combines in his own character a very profound acquaintance with the truths of induction; but is commonly more intent on their application when ascertained than in their discovery. But though the most pernicious this is not the particular abuse of deduction most generally complained of; there is a facility in combining premisses for the *a priori* method of argument known by the not yet extinct school of Aristotle which Bacon laboured to caution us against, seeing that for centuries upon centuries it had been proved ruinously alluring to the scientific world,—a facility universally captivating, and that must continue dangerous to individual philosophers until each for himself shall have so accu-

mulated inductions in his own mind as to begin to see them as it were coalescing into a system. Then and not until then can conclusions from Induction serve any one as a broad basis for an argument on universal causation, and he be warranted in changing the *a posteriori* for the *a priori* form of reasoning. No wonder then that we hear on all sides an outcry raised against Deduction proclaiming as illusory the prospect of arriving inductively at such an insight into nature as shall enable us to begin theoretically with its causation in the hope of pursuing it into all its details. But that outcry is in reality no more worthy of respect than any other impulsive movement against order and reason; involving as it does in its logical bearings a begging of the whole question at issue. By its fruits only can a conclusion respecting universal causation be appreciated; and as the fruits of no argument can be known by anticipation it can only be by deeming deduction worthy of investigation that we shall be able ever to obtain that solution of this difficult question without which no one professes to believe we can ever rest contented.

62. There is no essential difference in the logic whether we be proceeding from effects to discover causes, or from causes to predicate effects; the two processes when traced from one truth to another are equally infallible at every point, even to their final conclusions. We see this exemplified in the problems of arithmetic and geometry; for in either case and at each of its steps, be the premisses true or false, so will

be also the result arrived at whether the process be synthetic or analytic. It would be making a great mistake to imagine there is necessarily greater certainty in reasoning one way than the other; every difference must be an accidental one, for let the premisses be true and it will be as impossible to obtain from them by either the *a priori* or the *a posteriori* process a wrong conclusion, as it would under the opposite condition of their being untrue to obtain a right one. Nothing declares more plainly the different values of true and untrue premisses than the confidence with which we trace the former through the longest mathematical problem either deductively or inductively, compared with the diffidence we feel when extending a physical argument based on premisses only probable.

63. Thus whether we investigate nature by *a posteriori* or *a priori* reasoning we come equally to truth, provided only we select equally indubitable premisses; and this we might have taken for granted by reason of the nature of syllogism which cannot apply truth awrong for the elucidation of nature, any more than it can apply probability however great for the discovery of certainty. What we should aim at in the construction of syllogisms is to base them so far as possible on the intuitions embracing as they do all demonstrations; and, when they fail, making up the deficiency by such inductions and deductions as are the most probable and therefore approximate the most closely to truth, though they can never be used as truths of which we are assured. There must be in the universe as it exists

around us enough of evidences, if we could only arrive at them by induction, to lead us back to creation and a Creator; and once arrived there deduction would only need time and patience with ample division of labour to lead us diverging in all directions from the common centre to the minutest particulars of all His works.

64. What we call facts of observation are frequently reported to the percipient mind as truths when they are not; and if in such cases the mind receives the report it suffers for its credulity by being deceived. Inductions from fact are thus sometimes made untrustworthy either by default of normal powers of observation, as when Dalton saw ripe cherries of a green colour; or in other cases by reason of observations insufficiently made, and which Newton had doubtless in mind when he insisted on the necessity of true physical causation for basing the logical arguments which were to support his *Principia Mathematica.* In like manner untruth may appear before the percipient mind as truth by default of its own vigilance in insuring that the premisses of its deductive arguments are certainly true, as when the mathematician errs in his arithmetic or his geometry.

65. Induction, inasmuch as it must be preliminary to the premisses used for deduction, is on that account the more fundamentally important of the two modes of inquiry; though the latter is as already remarked singularly abused in practice by mathematicians whose proper province it is to favour exactitude both by pre-

ccpt and example; and who presuming perhaps on the accuracy of their step-by-step movement often disregard the foundation of their argument as though they could not be doubtful of its soundness, because the final conclusion so exactly accommodates itself to their anticipations. Only grant the non-inductive mathematician that effects are invariably proportionate to their causes, and that actions are in physics as well as in mechanics opposed by equal and opposite reactions, and he will require of the chemist to perform the impossible task of doing with two atoms of oxygen neither more nor less than double what he can do with one of them; and the electrician to just double the force of his attraction at a given distance by a doubled quantity of electricity, instead of exactly quadrupling it as he knows he thereby shall do. For a truth to be useful axiomatically it can admit of no exception; and therefore for sake of an axiom untrue in physics, true as it may be in mechanics, the mathematician, by begging the question in either of the above cases ought not to be allowed to vitiate a physical fact.

Fourth Section.

Attraction and consequent motion of matter with variety in velocity and direction the only physical effects of mental causation and the essential characteristic of second causes.

66. Cause is not the less spiritual in its character, or nature, when acting upon matter than when it is

having a metaphysical influence over mind; although —*having regard to its effects*—we name it mental cause in the latter case and physical cause in the former. In harmony with this distinction we call cause by its scientific name *Force*, when speaking of mind with relation to Physics; believing there is no force really in existence but Mind or Spirit, the myths which are spoken of as 'the forces of nature,' being all traceable to motion; while motion, or a tendency to it when movement is impossible, is the sole direct physical effect upon solid matter resulting from mind; to the mere volitions of which every cause in nature is directly or indirectly referable.

67. Mind, thus acknowledged to be the universal First Cause, has, beside its duration, no magnitude in any sense that can be represented by the measures common to physical science, and which are all derived, more or less immediately, from either the geometrical linearity or the volume of Space; but the duration of mind is implied in physical science, because an act of dominant Will causing a physical effect need have duration in order to establish its result, which is the maintenance for a shorter or longer period of some particular motion of matter designed by the Creative Mind, and which when inaugurated needs to be continued from one instant to another, till the end of time, if not put an end to by contact or arrested by counteracting movements of matter set up by the all-commanding attractions.

68. But He who willed the motion of the matter by

giving its parts reciprocal attractions has power to terminate it without revoking his own act, and by a means as simple as that by which the motion was occasioned, namely, by obstructing its further progress under the moving force by solid resistance, at any point, opposed by matter massified and localized by the same or other attractions acting with predominating magnitude or intensity, commonly understood as *inertia;* or even, without actual contact, by such greater reaction opposing the motion from a greater distance. This consideration provides for the action of cause on matter until it shall have effected its purpose; and opens up to our perception the simplest view it has been possible to take of the hitherto enigmatical *inertia* of the Newtonian Philosophy.

69. There is much in nature which this balancing or partial counteraction of forces by reaction makes practically intelligible. Thus a physical action of mental cause producing a sensible motion may, by suitable devices, be observed to balance, and to be balanced by some other action equal to itself: such equality being denoted by the exact neutralization by each other of two equal effects, as two equal motions in opposite directions; or by a moving body transferring its motion, in exchange for rest, to some other body equal to it and not at the time moving; or, again, by various other conflicting operations of force known to the mechanical philosopher. In some of those cases the exact destruction by one another of two motions will denote their equality; intimating to the physicist that

the purpose of each has been fulfilled. In other cases the mental force exerted in establishing the first motions may be considered as in part handed on by the residual motion to produce a second movement equal to itself and occurring in a subsequent time, perhaps to be afterwards transferred in a similar manner an indefinite number of times, so long as there is work still to be done by the same initiatory impulse of the causative mind which can know the end from the beginning.

70. During the continuance of a line of second causes it is only in exceptional cases that actions and reactions can be practically compared and found equal; the Designer of nature presents them to us under an intricate system that we consider to be very complicated when we judge of it respectively by its effects—in which motions must be incessantly coalescing, and again infinitesimally dividing and sub-dividing, in order to become in their disintegration opposed by corresponding combinations and redivisions of reaction; all which may be mentally conceived to a far greater extent than can be practically investigated. But whenever the successive effects traceable back to the same cause and presenting themselves in consecutive order, whether contemporaneously few or many —that is, undivided or divided—can be estimated in their collective sum for comparison, it is always found that the sum total has a value precisely equal to the originating second cause.

71. From that circumstance it is, and has been from

early times, inferred that effects were physically equal also to the force from which they spring; and hence —while ignoring the truth that force can only be a mental volition—has been deduced that axiom which declares, without making exception in favour of First Cause or mental power, that causes and effects are always necessarily equal; whereas, cause being unmeasurable, it is only effects to which the assertion applies, they being called second causes for the very reason that each preceding one in a line occasions its immediate successor to represent it in magnitude.

72. We can understand that physical effects, following each other as a line of second causes by appointment of their common mental cause, supposing time to be rolling on under uniform circumstances, should have the same value whether measured by time or space—that is to say, for example, two motions would be equal if one had a double velocity for an unit of time and the other an unit of velocity continued for a double time; because either effect is simply equivalent to the other. If resistance to motion interfered with such a purely physical result the case would become one of mechanics requiring the resistance to be taken into consideration. And as velocity denotes quantity of motion in a given time we may express the facts of this case differently, thus: a quantity of matter moving a given distance in an unit of time is, as an effect of force, equal to the movement of half the quantity of matter through a double distance in the same time; that is to say, the time being given, the effect of the

moving force is simply as the quantity of matter multiplied into the distance traversed.

73. Now we can conceive nothing in the nature of mind, or in its action as physical cause, from which we might have anticipated that in the establishing of second causes, an addition to velocity—which is either increased passage in an unit of time, or an unit of passage in a lessened time—should result from diminution in the quantity of matter moved: or that diminished velocity should be the consequence of an addition to the quantity of moving matter. We know not how mind and matter can affect each other, and yet that they do so is a plain result of experience; and the circumstances now under consideration declare intelligence and commanding power to be both present in second causes as they are acknowledged to be when First Cause is in operation.

74. And therefore we should not be surprised that in a line of second causes following in succession an initiatory act of mental causation they are not as is generally supposed necessarily in every instance equal both to one another and to that cause which commenced the line; that they always are so with a single exception we not only admit but maintain; but we can perceive no reason why among the changes in circumstance introduced at successive times conditions may not arise to change the magnitude of the electrical force at any point of the line, and which practically do occur, thereby making the subsequent effect either

greater or smaller, as the case may be, than it had already been.

75. On this section of our subject it remains to be added that inasmuch as man and the lower animals can each to some extent exercise a volition powerful enough to inaugurate changes in the motions of matter so far as direction and velocity are concerned, and to thereby divert the purposes of the Divine Mind as the sovereign cause; so is each of them to a corresponding extent efficient in modifying the physical action governing the material creation.

76. We can now intelligibly enough understand the relation borne by second causes to the First Great Cause; and perceive that all cause without exception is mental, even to the production of those effects, or circumstances destitute of consciousness which so universally modify the workings of the Supreme power; and for establishing which, each in his degree, every subordinate mind is individually responsible to the amount of the option delegated to it.

77. Though we are propounding a distinction between physics and mechanics, it must not be supposed we exclude the consideration of either. The Author of the universe is the architect of both sciences, and we find much in his work that we cannot ascribe to physics, pure and simple. The balancing of forces of which we have just spoken is not a feature of all natural phenomena however frequently such a balancing may be had recourse to. Without action and reaction to

neutralize each other mechanics would have lost one of its supreme principles; of which physics on the other hand is quite independent. We wish it were more generally borne in mind that chemistry as a branch of physics ignores reaction altogether; for though the attractions of two elements of a compound are necessarily reciprocal, in no instance does either of them exert a definite amount of action at all times. The reciprocity of chemical affection or affinity has never been metrically equalized in the two directions, and hence we quite properly exempt chemistry from the domain of mechanics; while assigning both chemistry and mechanics to physics.

78. In undertaking to derive all the known operations of physics from the motions of the solid atoms of matter in certain specifiable directions with respect to one another, and under the impulse of unequal but definite magnitudes of attractive force, only one of them being known to be variable; it may be imagined that we have entered upon a task impossible of completion, and that we are injudiciously calling upon science to do by deduction what induction has not yet qualified it to perform. Let us go forward and ascertain whether it be so; or whether, on the contrary, the alphabet of nature being in our hands, we shall be able to make known something of its grammar also, and among other things to prove that second causes only differ from First Cause by beginning with an antecedent effect immediately its own, and which they have derived from it as initiatory perhaps of a long line.

Fifth Section.

Materialism in the place of Causation.

79. Hitherto in our attempt, by spiritualizing physical science, to reduce its theory to order and thereby reconcile natural to religious truth, we have introduced as necessities for creation only the nothingness of space and a mental power, or Life, capable of acting by the energy of His own Will from any part of space to any other point, bringing together as solid atoms the minute spheres He has made geometrically impermeable to one another. We have represented that Life as projecting His power from one atom to another to draw or attract them together in the right line by which they are joined; or in a multitude of such lines radiating from a common centre; the attractive power being exerted in different cases with various magnitudes of energy, and each varying in intensity as the energy passes outwards in consequence of its dilution by the constantly increasing geometrical diffusion.

80. Another characteristic of the new system is that it exonerates second causes from finding their equal effects when extended into space beyond the realms of matter, where their last effect can have no opportunity of becoming in its turn a cause. This is a conclusion utterly subversive of the doctrine of reaction as a universal principle of physical science; for the last action will have no matter beyond it from which reaction can possibly be directed and thrown back upon it.

81. The President of the British Association while recognizing in his late address the "immoveable basis of the religious sentiment in the emotional nature of man," saw his way to "discern in the matter which we in our ignorance,—and notwithstanding our professed reverence for its Creator—have hitherto covered with opprobrium, the promise and potency of every form and quality of Life." If it be not very plainly shown in the above expressions how the religious is to be reconciled to the materialistic sentiment, still—recollecting how widely truth by intuition is sometimes damaged by the faulty conclusions of invalid induction —we may be able perhaps to extend to the endeavour all the weight of meaning desired for it, and to invest it with the commission of honestly "abandoning all disguise." Some day philosophers may know how gratuitously materialistic many of them become in defence of their ill-founded inductions. Professor Tyndall seems to think "the lifting of the Life is the essential point," and he calls upon the science of the present day "to raise Life to a higher level," assuring us that "so long as dogmatism, fanaticism, and intolerance are kept out various modes of leverage may be employed," even encouraging us with the remark that "science itself not unfrequently derives motive power from an ultra-scientific source." If then it should ever teach us the nature of Life to the Professor's satisfaction, we may hope he will not hesitate to declare the fact; and with that we ought to rest content, heartily wishing him God-speed.

82. We call nothing by the name—Life, that is not conferred by Life; and we define animal Life to be a temporary authority conferred by the Supreme Mind of the universe upon material organisms associated with minds so commanding the matter that some of its affinities are suspended when the contacts of molecules would of themselves establish chemical action; while, on the other hand, molecules are thrown out of chemical combination to be immediately replaced by others of like kind, and from which they differ only in the positions of the external electrical atoms of their equivalents by virtue of their respective magnitudes and intensities of attraction, as has elsewhere been explained.

83. This suspension of affinities by the influence of Life is a well-observed fact that might be traced to the physical principles of this but of no former theory, while the effect of varying electrical magnitudes and intensities in determining whether molecules shall be held in connexion or thrown out of combination may possibly become an interesting subject for mathematical calculation. Pending the duration of Life the associated human mind, by some faculty that we may suppose common to spirit, perceives the conditions of the material organisms with which it is in connection, and which are known as their sensations; and when the organs can no longer change those conditions by making new observations the purpose of Life is answered, and it ceases.

84. In supposing that organisms confer Life instead of being made what they are by the influence of mind

or spirit making them alive, the mistake leads us further wrong into confounding organization as the alleged cause of Life with the circulations, combinations, and depositions in plants; thereby extending Life beyond its boundary; whereas there are analogues to all those circumstances in the mineralogical actions of chemistry and electricity to which vegetation physiologically belongs. Matter universally may be said in a figurative sense to observe its environment, or *entourage*, inasmuch as such passive observation is the condition of all action upon it. Life, we repeat, is a spiritual loan—a temporary gift of subordinate spirit by the supreme spirit; the association of mind with matter by the Creator making the animal; which, no longer remaining alive after the dissociation of the spiritual and the material elements, they become isolated one from the other to be restored to their individual natures.

85. Under the leading of materialistic principles we have seen that the great mistake was committed of referring the truths of mechanics to pure physics, imputing to physical action an invariable reaction of precisely equal amount. The subject of reaction belonging as it does to the mechanical employment of force has already in more than one instance perplexed physicists in their attempts to correlate the forces we ascribe to mental volition, which on no principle we can discover will submit to be generally correlated. And it should not be forgotten that the sagacious Faraday was obliged to except gravitation from the empire of the

axiom when he had to consider the force in the light of pure physics; or, if we need to ascertain what our own sentiments would be under similar circumstances, we need only seek to discover any action that can balance, or to the smallest extent react against, gravitation projected from our system into the so far off depths of space that nothing may there be found under attraction in an opposite direction.

86. If we were acquainted with all the forces operating physically and could appreciate at every moment of time what they do to matter, knowing thereby their effects in establishing second causes, there would be little left to be problematical: nothing fundamental that could be distinguished as probable or improbable; for the leading events in material nature would be as certain as the conclusion of a logical argument founded on true premisses; in short, we should be at every turn as much in possession of experimental demonstration as though we had derived it from an incontestable sensuous observation.

87. Now although human nature may never have particularized to its satisfaction the forces called physical, and assigned to them a mental nature it has for ages assumed that for the government of the material, as well as the moral world, a power exists which, when regarded in contrast with that of the human mind, can only be regarded as Almighty; man thus escaping —though not in the most scientific way,—from acknowledging the reign of unconscious matter which we even now do chiefly by disclaiming sympathy with a

number of philosophers who profess materialistic doctrines, while passively taking part with them, and thus consciously or unconsciously tolerating them. It still remains for us to make ourselves certain that the physical forces of nature are all as represented in this work—mental volitions.

88. In our earlier pages have been briefly mentioned the experimental observations from which we drew that conclusion; and inasmuch as only students of statical electricity can be conversant with them, we may now in support of the same conclusions make reference to other more common experiences of a like character:—

89. Every individual among us is prepared to behold, as the effect of his forming a personal volition with respect to anything he has power to cause his muscles to perform, the evidences of a ministerial function of his creature mind ruling the matter of his own body, and through it modifying the second causes round about him; and analogy and experience justify him in concluding that mind, much lower in the scale of creation, is commissioned like his own with an exercise of power over material parts which animality also places under its authority for carrying into execution certain of its purposes in the economy of creation.

90. To the human mind, therefore, in command of matter appropriated to it for instrumentally impressing the consequences of its volition on external nature, so far as it may be within its reach, it should not be difficult to understand that all other animals similarly

composed of mind and matter, expressly organized for the purpose of complying with the mental mandate, should, with the human race, have their great prototype mentally in the Creator, whose greater mind governs matter generally, whether organized or unorganized.

91. And all force being mental, from Him downward, it is clear that matter without mind associated with it is without the force which is synonymous with Cause; having in truth nothing to distinguish it from Space but its exclusive occupation of the place which contains it. This conclusion is advanced as positively inevitable, and not in the character of a probability to be admitted on sufferance. Matter without localized or creature mind in command of it, is, when briefly defined, nothing but solidified space. The nature of mind without matter can only become known to Man through his intuitions, not his observations; and therefore is hardly a subject for the present investigation.

92. The passivity of matter is a doctrine which philosophers have held in all ages: we find it in the learning of the East; in that of antient Greece; and now in England and the continent of Europe generally; and though there have been everywhere and in all historical times deep-thinking students of nature labouring to exclude the operation of mind from the government of the universe, their attempts to represent matter as automatous have been exceptions to the general rule, and usually regarded as violating reason while professing to be wholly led by it.

93. The materialism which has found a lodgment in our midst is for the most part in a mitigated form; but perhaps therefore only the more insidious as it escapes from bearing upon its front the charge of infidelity; nay it even wears a religious aspect, carrying creation in the simple honesty of modest diffidence beyond the limit of the truth; thus betraying thoughtlessly what it claims the merit of upholding, for it makes, tacitly at least, the eternal necessities to be part of creation. And the orthodox in religion though they can believe in the "let it be and it was," as the sufficient means to the end, cannot trust the support of creation to its Architect and Builder, but invest the materials called out of nothing with active powers created by means not conceivable by reason like the solidity of matter; and, what is infinitely more incredible, for no imaginable purpose unless it be to save Him from watchfulness who never slumbers, and from fatigue Him who never wearies. Why should we impute anything finite to the Infinite?

94. But materialism is not always characterized by such faith even misjudging as it is; in the present day we have imported a serious proposition to refer matter with its alleged forces to a reigning intellect devoid of consciousness, if nature be allowed to have any origin at all; nor can we reasonably doubt that the view of created forces with its annexed irrationality is calculated to prepare the way for the latter more extreme doctrine. So indeed our theologians, lay and clerical must think, or they would hardly be intent as they are to lay down a line of demarcation between science and religion

which philosophers are not to overstep, rather than themselves encourage research to establish the fundamental doctrine of the passivity of matter, and the direct volition of a personal God, which they might do in a full and warranted assurance that the two books He has written of Nature and Intuition, must, when compared, conform to and confirm one another.

95. We are made very sensible of the paucity of language when we attempt to confine words to a literal scientific meaning, and find them generally employed in a figurative sense. We wish now that Cause should only imply the powers of mind to command the motions of matter, and particularly those volitions of the Divine Mind which establish effects in lines of second causes; and we find the word in common use to express also simple precedence of events in the order of time; in which sense it is that we have to understand Newton's protest against unduly multiplying causes—and by inference effects also—in the investigation of physical science: his sagacity perceiving that by inattention in that respect a hindrance might be introduced to the advancement of science by rational induction.

96. Nor are we strict enough in providing against such hindrance to progress when we carelessly allow inductive premisses to be in their language comprehensive beyond the limits of observation; as, to give an extreme case, we are in declaring,—what we only infer as extremely probable because we have never known an exception, the possibility of which exception we cannot deny,—that all living animals will die. Now so

far as logic is concerned there is no difference between taking that step and asserting that all causes and effects are equal, while knowing that all cause is mental and we without any means of measuring volitions. In putting forward such an extreme example of inexactitude we wish it to be considered how narrow is the line that separates truth from uncertainty, and that it is to overstepping the slight boundary in innumerable instances that we have to attribute our thraldom to materialism and all other forms of error.

97. Even if we could do so it would be unnecessary to compare mental cause with its measurable physical consequences. It is enough for all the purposes of physical science that when effects follow one another in a line of so-called second causes each cause is equal to its effect; for thus they make Divine action, whatever its amount, to be uniformly enduring until its purpose be accomplished whether in an original movement continued indefinitely in the heavenly bodies, or one divided into a multiplication of motions of minute material things, each motion contributing to make up in the whole a never-differing sum total of effect precisely equal to their second cause. By such second causes the constancy of nature is maintained, and for which no reason need be sought beyond the orderly mind which administers the affairs of the world according to His own Will.

98. It is to discover the character of that Will with regard to material nature that we have to address our

scientific efforts; and we can only infer it from the facts exhibited to our senses,—facts so numerous and diversified that half a century has been passed by the writer in their deliberate consideration preparatory to placing them collected and classified in a system of nature before the public. The final use he has attempted to make of them has been to ascertain:—Firstly, the number of Forces considered as physical, or divine impulses acting on matter to produce the movements of nature. Secondly, their comparative magnitudes as determined by the initial velocities of the motions they respectively establish. And thirdly, the kinds of matter on which the forces severally act.

99. And this knowledge, impossible as its attainment may appear, has been at least approximately arrived at by induction; the nature of all the forces being resolved into attraction, each force having a magnitude peculiar to itself, and, whatever that magnitude may be, operating to bring the materials under its influence into absolute contact with one another, or when that is impossible, giving them a tendency towards a contact. These spiritually caused motions will become subjects for exposition in the ensuing Sections of this essay, and be applied to the phenomena of physical science as circumstantially as opportunity will be found for doing.

Sixth Section.

Natural Science the relation of created Physics to uncreated Metaphysics.

100. The acquisition of knowledge is practised by the mind of every human being from early infancy to the latest age; for the babe seeks quietly for an acquaintance with the world into which it has been lately born, and the man, beside such information, cannot repress a desire to learn more about the world into which his mind or spirit will next have to enter.

101. No knowledge can possess the mind which it does not derive immediately, or mediately, from one of two sources: either intuition—which is inspiration—such as our instincts; not to be mistaken for sensations of the material frame, on the one hand; nor, on the other, with observations reported by the corporeal senses to the mind by their connexion with it, and the nature of which connexion is past finding out.

102. When we speak of knowledge as a result of animal experience it is to observations by the senses, or rather to the reports which the senses make to the mind concerning such observations, that we are supposed to refer; and although we cannot accumulate experiences at will regarding information gratuitously bestowed directly on the mind, still it is questionable how far our profiting by information freely inspired is not influenced by the willingness with which we entertain and contemplate it when communicated.

103. Knowledge by intuition then is immediate and

depends simply on the wisdom of its donor, and the mind's natural powers of perception,—not at all upon its reasoning; and, consequently, so far all human beings are upon an equality. But we acquire knowledge also mediately by the reason; which adds the results of our experience, by perhaps unconsciously planning syllogisms founded on intuitions and observations, the conclusions of which are to the reasoner new truths; provided his mind confines its argument within the bounds of verity; in his power of doing which one man differs from another both naturally, and in no small degree as a consequence of education, or habit, becoming thus distinguished from his fellows.

104. Whatever be our knowledge, whether received immediately as a direct and free communication, or acquired by the exercise of sense; or whether it be mediately acquired by reasoning on truth, it is of two kinds—not as respects its derivation only, but also to its relations; being either physical and relating to matter, or else metaphysical and relating to mind.

105. Physical knowledge has to do directly with our existence in the world of time; where alone our animal organisms can meet with materiality for their formation and sustention, until, forsaken by our minds, those organs, no longer animal, are laid down to subserve the terrestrial purposes of a later time.

106. Comparatively estimated our metaphysical subjects of knowledge are of much greater importance than our bodies with their physics can be; for at present they contribute the mathematics and ethics to our

mental well-being as animals; and they will be qualified when the animal is no more,—in that future separate state of our spiritual existence of which we have the knowledge by personal inspiration,—to perpetuate their benefaction to our minds for a more enduring continuance.

107. So important are the metaphysical elements of nature that certain of them must even be regarded as essential pre-requisites for the creation, as it is impossible to conceive them to have ever been brought for a first time into existence; even the distinctions of ethics can hardly be thought to have a lesser antiquity than the eternal mind of the Creator, in which virtue and vice may not be supposed to have only a temporary distinction; while it is absolutely impossible to imagine that the principles which constitute the truths of geometry and arithmetic, with the mathematics as their total sum, could ever have been untrue, even at any bidding. We say this with reverence, though some will deem it presumptuous, and to them we would offer this apology: we are suggesting a logical method of creating the universe out of nothing by the power of an almighty Will, and at the same time pointing to a distinction between creation and nature. Now, what we would remark is this: had there not been at the epoch of the creation a metaphysical empty space already in existence as place to receive from a competent volition the commission to hold itself in part exclusively to itself, solidity—which is our whole matter—would be still to us unknown.

108. Not only space, but time also as it is known to us, is a pre-requisite to material creation; inasmuch as without time the duration of elementary solids, and of their successive combinations with one another, as well as their consecutive movements in particular directions through space, could never have been measured by the animal mind, and therefore must have remained to the animal an impossible conception. But for the temporary existence introduced, so far as we know, with mundane creatures, we could only have thought of time as a never-ending line of continuance in a single direction; just as we think of space, or the nothingness of place, as extending without limit in all directions.

109. Together with time and space with its geometrical properties, everything else in nature would have remained metaphysical, had there not been within the unbounded nothingness of unsolidity a mind with power so unimaginably unlimited as to be capable of setting apart minute measured spaces, all to be held, so long as He shall will materiality to endure, as individual volumes distinct from each other; such distinction being to all intents and purposes a physical creation of chaotic matter with no other property than solidity, and passive resistance; that is to say the maintenance of its own volume.

110. We have here spoken of the creative power, by which solidity was educed from nothing,—materiality from immateriality, and physics from metaphysics,—as unimaginable; but in so speaking we shall be understood to be referring to its *modus*

operandi, just as in the case of our finite Minds we speak of their power in compelling the submission, each of its own little world of matter, without imagining how they secure compliance with their Will. We only know the submission to Will as a fact, without being able to trace the causative action of mind in producing its effect. That there must be an action, although to us inconceivable, is, in either the Divine case or our own, equally clear; or reason would send us back again into all the darkness of chance for an explanation of our own actions as well as those observed in creation at large.

111. The creation of matter as a chaotic basis for physical nature at the instance of a metaphysical mind, and the organization of the world by the active powers of the same mind in command of the passive chaos, with no forces in exercise than those of personal volition; leaves—not materiality uncreated—but, nevertheless, everything still, with relation to its cause, metaphysical. And the universe being in reality nothing but the embodiment of a Will, on which it depends for its continuance; it must be that the preservation of the one could not survive its revocation by the other. This may be hailed by the partisans of Berkeley, as realizing the imaginings of their leader in philosophy; and its consideration is commended to them as putting what is really true in the Berkeleian system in the light of a more acceptable form of physics.

112. What then is creation more than an expression

of the Will of God? With the answer to that question may come a remark that in these pages something more has been assigned to nature, if not to creation—which man is wont to consider the same things—in what are now being described as the everlasting necessities of truth; and perhaps there are many believers in revelation to whom the distinction now made between nature and creation may seem offensive until they have fully mastered it; to them it may be suggested that it will be useful to allow the writer,—who is already satisfied on the subject,—in the meantime to offer the eternal endurance of the metaphysical truths in question as a sop to the Cerberus of Materialism, who is now doing its utmost to howl away the divinity of creation, and may be diverted by finding it admitted that any part of nature has not been created.

113. Both physics and metaphysics are indispensable in the pursuit of science by the method of induction from experiment. The relation of the two kinds of knowledge to nature may be aptly represented by the branches and roots of a growing tree meeting together in its trunk; the physics exposed to view by the senses, while the metaphysics are palpable only to mental perception. Through the trunk every twig of the several branches and each fibre of the root are in communication, as the truth derived is with every other truth concerned in its derivation, each traceable from any of the rest, and the whole of them to a common origin. But this is only allegory, and less adapted to depict the exactitude of truth than the realities of prosaic description.

Seventh Section.

The Infinities volumetric and enduring of Negative Space.

114. Believing in the formation of solid atoms by the appointment of minute spheres of empty space each to an exclusive possession of its own volume, we cannot but regard matter as susceptible of annihilation by Him who created it; nothing more being requisite for that purpose than the liberation of the geometrical spaces from the duty of remaining severally isolated as He had the power of imposing, and did impose, upon them; and by performance of which duty, and that only, they still differ from spacial nothing. On their discharge from commission the very places of matter would be again only part of that fathomless negation to which the human mind can assign no limit, either with respect to its volume or duration, and thus matter might be destroyed.

115. We adopt space as the basic element of created matter for two reasons about which we cannot deceive ourselves; firstly, it furnishes the place needed by the volume of the solid into which creation changes it; and, secondly, space perfectly represents in its metaphysical character the nothing into which the annihilation of matter would necessarily again resolve it. Than space we cannot conceive a more literal nothing, needed as a place for containing solids and marshalling them into orderly combinations and movements; and

as space is eternal in its endurance as it is omnipresent in its nothingness, so also must be the truths relating to it; all which we describe on the principles of geometry as the metaphysical properties of space; and so far from being things originating in creation they are rather bases of everlasting truth adopted by the Supreme Designer and Worker into the universal plan on which all that is created has been founded.

116. So vast is the volume of space that, notwithstanding the universe of matter created within it, it is figuratively speaking still empty; for no comparison is even conceivable between the materials in space, and the place without a boundary which creation, however extended, never can fill. No word-picture that can be written is adequate to give a notion of a capacity in which never-ending lines might be extended in every direction from a point wherever situated.

117. The existence of space cannot be supposed contingent on the creation of which it is the field; the utter destruction of all matter at any moment could only leave the nothingness of space with all its geometrical truths as ever in perpetual unchangeableness. As space, *per se*, was in eternity past, so it must be during time and for all eternity to come; it, with all concerning it, alone is of necessity coeval with the Deity—the same yesterday, to-day, and for ever.

118. As space can never be wholly pervaded by anything less voluminous than itself; and itself is infinite in volume, while all creation however much extended would be if estimated together but of finite

extent; it follows that there cannot be anything material occupying the whole of space; such as the imaginary elastic matter with which the speculations of philosophers have filled it for the theoretical production of Light.

119. The universal occupation of space by matter now controverted is incompatible with certain principles of physics which it is impossible for us to put out of consideration, for it would need that the matter should be infinitely elastic; for space, being infinite, and therefore without confining boundaries, would leave the elastic matter expanding for ever, by which, in conformity to well-known physical laws, its elasticity would gradually become lost, until the matter were rendered useless for its imputed purpose.

120. We cannot but bear in mind, in connection with this subject, that in times past an unknown elastic matter was supposed to be occupying space with aerial vortices for carrying round in their motions the heavenly bodies; and that in more modern times astronomers would have their self-esteem wounded if they were asked whether such an hypothesis ever occupied their personal belief.

121. Neither the sun, which occupies a place in space about a million and a half times greater than the earth, nor even the orbit of the most distant planet moving round the sun, can give the least conception of the immensity of space; for the largest geometrical sphere that the human mind can imagine in space might still be in any proportion larger, and that too

simultaneously in the midst of an infinite number of equally large figures without the spheres coalescing. In simple truth the only thing to which in its all-pervading extension space can be likened is the Divine Mind immeasurable in its spirituality.

122. Our intellect perceives the unlimited volume of space to be susceptible of penetration by lines geometrically projected in any or all directions; every such line individually representing length, or distance; two such lines, transverse to one another, measuring length and breadth, or surface; and three such lines, measuring length, breadth and thickness, representing cubicity, which is the only necessary qualification for containing the material solids of creation.

123. The solids of creation admit either of juxtaposition, or of being by virtue of the space in which they exist separated from one another by sensible distances which may be great to an illimitable extent; and in universal gravitation science has evidence to make it probable if not certain that no conceivable distance is so great as entirely to separate the materials of the universe beyond each other's attractive influence.

124. And with all the forces of nature of a purely spiritual character wielded by Him whose Will is Power, what has just been said of one force cannot be imagined to have any exception. We name the creator and preserver—THE OMNIPOTENT—because His dominion extends over all; His Volition operating everywhere, from all His appointed centres of action in atoms to the remotest places, with a consequence

rigidly subordinated by Himself only to geometry—a fact we might have anticipated from His orderly mind if we had not known it from observation, and by which He has established the universe on the basis of everlasting truth and exactitude.

125. Had this been always understood the common sense nature of space need never have been called in question, nor science agitated by attempts to explain its physical phenomena by contiguity of matter; a contiguity only to be provided for in certain cases by suggested emanations of luminiferous matter from the sun, fixed stars and all incandescent bodies. Instead of this the vacuum of nothingness might at once have been regarded as overstepped by cause whatever its nature; and illustrated as might well have been by reference to those attractions of electricity, one of which we have spoken of as the far-reaching force of gravitation of the Newtonian system.

126. Intent as we are on pointing out how matter is at first formed and then subjected to the operation only of mental Will, we cannot rationally admit that the power of God requires to be conveyed by matter from place to place; and although there is no palpable overleaping of distance in the subordinate case of our own mental power; there is equally no proof that its action is not of the same kind, though limited in reach by its finiteness. It has been explained on the principles of the geometrical distribution of action why the Divine operation is not equally intense under the circumstances of differing distances; that will come under

our notice again, but it is enough just now to demonstrate that on our principles the Divine action is possible and certain, though subject to variation according to an everlasting principle of truth, let the distance be whatever it may.

127. Practically we learn the cubicity of space by sensuously observing that the solid bodies within it do not remain in the same positions relatively to one another; from which we infer their motion, implying volume to move in. And we cannot with any pretension to certainty speak of extension in space as a quality of material things only; provided we do not mean by extension exclusive possession. Immaterial things occupy exclusively no volume, because they are unsolid; but though we conceive mind, or spirit, to have no parts, it may have an extension which science gives us no means of proportionately estimating; thus leaving us free to believe either that a human mind may be everywhere present—that is ubiquitous—or restricted to the locality of its own organisms of matter, which is the more likely of the two.

Eighth Section.

By space we geometrically measure, directly or indirectly, all effects of a physical nature.

128. When, at the beginning, space was in part changed from an unresisting nullity into solid volume, with still nothing active about it any more than before, the chaotic creation of matter was complete. Apart

from the consideration of that change space was then, and is now, unchangeable; even its solidification in part not taking from it the characteristic which, as nothing, it originally possessed of extension in three directions —length, breadth and thickness—by which it was, and is, adapted to afford to science three unalterable measurements; and from which the standards of measure now in use have all been derived, directly or indirectly.

129. Any straight line in space represents distance between its two extreme points. Three or more lines, whether straight or curved, joined by their terminal points inclose surface, or area. Surface with any linear thickness is cubic space or volume. On lines of measure weights are founded at the suggestion of facts.

130. We avail ourselves of these natural bases to obtain practical standards of measure by assuming for the purpose lines of definite length; the most remarkable of which, on account of the prospect there is of its universal adoption, is the linear Metre of the French.

131. Beside the standards of measure which involve considerations of linearity, superficies and cubicity in their applications to the appreciation of space, we have another less directly obtained which we derive from cubicity and call weight, or gravity; and yet still another compared with linearity and called time, which we apply to the measurement of duration.

132. With respect to the former of these we know that a metre cube, or 1000 litres of pure water weighs 1000 kilogrammes; and it is an hypothesis of the

present physical system that weight denotes in simple ratio the quantity of electricity attracted towards the earth's centre of gravity; so that a litre of pure water must contain a kilogramme of that particular kind of matter which should be called *electrum*, and whose parts are attracted towards one another from all distances by a force which is the sole cause of gravitation, and therefore subject to its laws.

133. We apply time as the measure of motion from one part of space to another by assuming it to be true that, when the velocity of a moving body is equable because the motive force is uniform, the body passes through lines of distance in proportionate lines of time; and from which we deduce the conclusion that when the distances and the times are not proportionate the forces vary with one another in a simple inverse ratio. As well as the motions of matter time measures its rest also, by comparing the continuance of the rest with the duration of standard lines of its own.

134. Every physical effect of Divine Cause consists in the initiation of a motion of matter in a right, or straight, line either toward a centre of force, or away from some place in space. In the former case the motion sooner or later comes to an end by the progressive extinction of distance; but in the case of projection the moving matter is started away on a passage that would, if uninterfered with, never arrive at an end.

135. Beside central attraction and projection we commonly hear of repulsion as a third force acting on

matter; but of repulsion it is only necessary to remark that nature affords no movement, or tendency to motion, that is not to be as circumstantially explained without such a force as with it—and that by repudiating it difficulties which it has introduced are often cleared away. Repulsion as a natural force has no place in this system.

136. Any motion—whether due to attraction, or projection—is only one among many existing at the same time with differing magnitudes or velocities, and in different directions; helping or hindering, or, as the usual expression is, accelerating or retarding one another, by the inextricable and reciprocal interferences that have resulted in confounding mechanics with physics to the disparagement of both sciences.

137. Thus interfered with in direction and velocity, and severally broken up into parts; the motions of matter become susceptible of comparison one with another in respect to their duration, their direction, and the force, or velocity, with which they move. These remarks apply to motion whether caused by projectile force or attraction; but, in the latter instance, as attraction is progressively increasing in consequence of the distance from the centre of force gradually diminishing, the force ultimately becomes and remains a maximum until there occur a greater reaction to neutralize and overcome it. The furnishing of such greater force ordinarily devolves on the elective attractions of chemistry, not to be here mentioned further than to say that but for the peculiarity of the major electrical attraction,

introduced to the reader's attention in our early sections, the decompositions and recompositions by what is known as affinity would never have taken place, nor nature have become what it has been made by creation.

138. Lines of time, only finite in length, whether extended back into the past or forward into the future, or in both directions, cannot make up the sum of eternal duration. Eternity is perhaps most comprehensibly represented by space; but time is unlike space in being measurable in linearity only, giving us no idea of either squareness or cubicity; nevertheless, it resembles space in being susceptible of occupation simultaneously by any number of solids in motion linearly without interfering with one another.

139. We divide time by comparing its parts with the durations of the motions of material things through measured spaces; and by those notions we compute durations in multiples and submultiples of any one of them adopted as unity.

140. Practically, time is computed by the uniform duration of successive passages of the earth round the sun in a year, as the effect of two physical forces, projection and gravitation, geometrically resolved into one to constitute the mechanical orbital motion; or by that of the moon's passage round the earth under similar conjoined influences, the revolution occurring in a lunar month. Or else by the rotation of the earth on its own axis taking place in a day; which is further divided into minute parts by motions that are artificially contrived for that purpose.

141. Each projectile act of First Cause compounded with equal gravitation considered as initiatory of motion is permanently sustained; the figure of the motion which results from the equality becoming changed from an exact circle by the irregular interference of neighbouring planets, their conjunction, or opposition, causing them to accelerate, or retard, the gravitation, while the impetus derived from the projection remains without change.

142. In all this, as in everything else, there is no measuring of Cause; what we call second causes, and measure under that designation is but the comparing of effects to find all in the same line equal; provided, as before said, no effect in becoming a second cause has changed an electrical force from one magnitude to another. Weight and time are both made measurable through their respective relations to the truths of geometry; which would still be in being if there were neither endurance nor extension to be measured by them; and it is to the fact that both time and distance are expressed by linearity that in investigating the falling of bodies Newton virtually came to the conclusion before arrived at by Galileo, making the forces of gravitation simply proportionate to the velocities of the motions which they caused.

143. As in the case of motion by attraction, the maximum act of force consequent upon the annihilation of distance still operates permanently in the final cohesion, so the motion initiated by projection is continued in its incipient velocity by carrying the force along with it;

and it follows that both rest and motion are normal conditions of matter presented for recognition in science under the terms inertia and momentum, respectively.

Ninth Section.

Limited physical action delegated to creature minds with Responsibility for the Second Causes they originate.

144. It has been hitherto thought sufficient to say that when a stone is thrown upward it falls again to the earth because matter gravitates, without settling the question why it gravitates; but if matter be passive and inert, as Newton taught and we are now maintaining, then the exercise of gravitation by the earth and the stone is a fiction—the fact itself an unexplained phenomenon—and philosophy has to find another force for the power, which is demanded of it; when it prefers mental causation to an adhesion to the doctrine of unreasoning forces in unconscious matter.

145. To prepare for perceiving the cause of the falling of the stone and how the gravitation is made a sensuous effect of force, let us first examine into the cause of the stone's ascent: what, we ask, made the missile ascend from the earth? both the motions are equally, according to the principles of physics now under consideration, effects of mental volition, and that the ascent is so needs no proof; for—while still

knowing nothing more about the fall than that it occurred by virtue of some force operating upon the passive matter of one or both of the two bodies—the stone and the earth; we are quite certain that they would not have first separated as they did but for the Will of the animal mind inciting the animal organisms to project by their action the stone upwards.

146. Here then we have animal mind acting as a first cause of motion; the incipience of that motion establishing it passively as one of the two normal conditions of the matter, to take its part among the second causes it will meet with in operation around it, and, be it remarked, for ever while it lasts at the moral responsibility of the mind to which the privilege of so acting by mere volition had been delegated.

147. Now, without embarrassing the question with any physiological considerations, we can be sure that the creature Will would have had no power like that of the Creator to change the rest or repose of the stone into motion, but for the intervention, between it and the Will, of the animal organization over which the volition directly exercised its command; commissioning its earliest moving part as a first effect of creature first cause to commence the line of consecutive second causes which extend in the projection, beyond the obedient organization, into a foreign region of matter where the animal mind could exercise no control.

148. Guided by this analogy, and put in possession by our first sections of the demonstrated certainty of

the governing by the Divine Mind of every molecule of matter, we are compelled by the plainest and most conclusive reasoning to refer the force of gravitation, as displayed in the descent of a falling stone, or a moving world, to the Will of God; who, as Creator, we cannot refuse to regard as supreme over all matter; as we, to a limited extent, have a subordinate command by His delegation over the material organization He has committed to our direction as responsible ministers of His government.

149. Hence it will follow as an obvious induction that the Deity, having the same command over material things universally that his delegates have over the matter of their own bodies; He, and He only, can exercise selection in instituting actions and reactions to be brought into reciprocal operation for the production of effects as second causes throughout all nature whether animate or inanimate; and those selections, or First actions of His own Will, we needs must regard as the fundamental and unalterable laws of creation.

150. And we are only ministers; not dispensing as He does an absolute power of our own minds. For we can neither originate by any of the physical processes we term vital an action on the materials of our own persons which is not already to be found externally in nature operating at the Will of the Deity; nor impress with the action of our own Will any material thing foreign to us, and with which our minds individually have not been connected for the purpose of its management: in other words the laws of creation are not

instituted by us, though in some small measure our minds are commissioned to administer them.

151. We learn from observation that responsibility for their own acts extends to creatures lower in the scale of creation than man; for the inferior animals pay at least physical penalties for the second causes they initiate; a truth which can be only understood as implying that they are amenable for the proper use of the reason they can respectively exercise as the result of personal observation and instinct, or intuition; which may possibly embrace some perception of the distinction between good and evil useful in their state of conscious existence.

152. In no line of consequences established as successive second causes by a responsible creature can their author do anything to recall them; all he can do is to modify them, or compensate for them by establishing collateral lines calculated, in his own judgment, or the opinion of his counsellors, to have a countervailing effect; and upon which he may hopefully seek for the providence of His interference to whom it belongs to deliver from evil.

153. The Creator has designed how each class of material atoms shall be attracted towards its own or any other class; and His determinations in those respects are what we most require to discover by experiment and observation to make us learned in the everlastingly uniform causes of motion. It is only delegated to creature minds, each according to its class or individual capacity, to originate lines of second

causes; which we do by imitating on a small scale, what He does on a large one; we providing the circumstances through the small portion of matter placed under the direction of our minds, and He through the whole material universe at His irresponsible command.

154. It is making quite a reasonable use of analogy when we thus conclude that what our own minds can do with the matter placed under their subordinate controul, another mind which is superior beyond conception can likewise do with the universal matter it has created; and which by right of creation is so clearly at its own disposal. And as the actions of men are results of mental design and not of chance; so He whom we have been made to resemble in some small degree by a superior measure of reason compared to that of other animals, cannot be supposed to act without unity of plan in the mental government of the world.

Tenth Section.

Chaotic creation of matter in passive atoms from the nothingness of space.

154.* If it were pretended that a theory of creation could be made to embrace the formation of material things with inherent causative forces investing them, as readily as with the alternative condition of passivity needing to be acted upon by their Creator's volition, the following two-fold reply might be suggested:—

155. Firstly, the force ruling in nature needs to be intelligent, or it would not distinguish those variations in circumstance under which its actions are known to vary in their effects; now such intelligence we cannot imagine matter to have acquired from the nothingness of space from which it has been derived, so as to have that attribute of mind inherent to its substance; and had mind been conferred upon matter generally it would be all living animal body.

156. Secondly, it is difficult to conceive a necessity for the creation of a force analogous to that of our wills over our own personal matter, for sustaining universal government; and, moreover, after one of the kind amply sufficient was already in existence, as testified by the Eternal Volition *sensuously manifested to our observation in the phenomena of electricity.* The fact of that manifestation of governing power we are now undertaking to confirm, by showing generally by inductive reasoning the accordances of the spiritual system of physics with the realities of nature.

157. It may be supposed to be in physical effect the same thing whether matter possesses innate forces for its own government, or is obedient to forces exercised by a mental being; but a little consideration will make clear the great importance of this distinction even in a physical point of view; for in the former case the consequences of a force must always be definite and unchangeable, while in the latter they may vary with surrounding circumstances; or, to put the truth in more striking language,—with inherent forces the

action of a compound body should be that of the united forces of its elements, while in the other instance the action may be altogether different to that of any of its elements; of which chemistry abounds with examples.

158. Every thing in created nature animated with the spiritual consciousness of existence has need of mental repose; but that necessity of animal nature does not make it impossible for us to conceive a spiritual Creator and Governor of the universe, whose nature it is never to be weary and require unconscious agencies to spare His own exhaustion or slightest fatigue in the execution of His designs; but we, who consciously minister to those purposes, must acknowledge in ourselves a habit of regarding the Deity as an abstraction rather than a personality, who unites to the full all the infinitudes of perfection which we admit so readily to be concentred in Him, while the admission is not allowed to impress upon us its due consequences. With God as an abstraction we sleepily repudiate atheism without awaking to the reality of the personal activity and power of a Living Divinity; and, more difficult than all else, to the realization of His actual presence in personal character in our midst: we can *believe* it, but it would be different to *know* it!

159. We are now in the way to KNOW it by going forward in the conviction that the passivity of matter has been made unquestionable by the experimental demonstration of the spiritual activity upon it, mentioned in our early pages; and we challenge the right of the most trusted professors of science to forbid our

steady advance until they are prepared to explain to us, in as reasonable a manner as we are now doing to them, the variation in magnitude at successive instants of the electrical attraction, while its intensity of action is remaining constant; for thereon hangs the great doctrine by which the present system of spiritual physics was incontrovertibly suggested.

160. That small differences in material condition, attended by great physical variations in the magnitudes of electrical force, will be competent to mark sensible distinctions in the execution of an uniform design, must be admitted; and provided there be in the executive Will no vacillation of purpose, its smallest feature cannot be imagined unimportant in originating consequences; or less effective in conducing to the consistency of natural phenomena than if it constituted one among physical forces inherent to matter; and vacillation of purpose in the mind of God is put out of question by His personal perfection.

161. Before its reduction to an orderly condition by the appointments of the creative mind, passive matter, having no power or property of its own but the volume and solidity which made it material, would necessarily exist in a state of chaos, or confusion; and with matter in that state it behoves us therefore to become first acquainted.

162. Now, we shall have a satisfactory conception of a material chaos if we imagine matter to consist of small parts existing in perfect independence of one another; no particle having action on any other par-

ticle; for under such circumstances the particles would remain in the places where they were respectively created; and without any tendency to combine, or move either towards, or away from, one another. While on the other hand if it were true that matter was created with innate properties and forces, other than the constituent volume and solidity; its parts must have been from the first in a state of activity and order, and not of chaos. Now without this chaos and with innate forces to begin with, there would have been no need for the Will of God to be moving it for the establishing of the order which we find in nature.

163. Chaotic matter, consisting only of solidity and volume, may very conceivably have been created, as we have said, out of nothing; the nothing, suited for the purpose, being already in existence as unbounded space —the all-pervading non-entity which was from the beginning in common with the eternal truths of geometry and the other subjects of necessary truth; none of which, as already insisted on, can have needed creating.

164. Geometricians can imagine the formation of spheres in empty space to be formed by circles rotating around their diameters. And as in geometry nothing is small or large absolutely, so in physical nature geometrically constructed small and large are only comparative terms. We may conceive therefore minute spheres of nothingness to have been thus formed in space by the mind of the Great Geometer of the universe; and only differing from one another in the circumstance of having unequal volumes by which, and

which only, they admit of being ranged in distinct classes.

165. But no geometrical sphere, whatever its volume, can exclusively occupy any part of space; any number of spheres of different sizes admitting of concentric positions, so that every smaller sphere might occupy a place within the volume of a larger one,—an interpenetration which is not a characteristic of matter. Spheres to be material, or solid, must occupy exclusively the places they are supposed to be in—that being the true and simple definition of solidity; and to make them solid by causing them to occupy their own places exclusively needs only that they be thereto appointed by Him whose Will is law to everything He has created.

166. Now this solidity of spheres, together with their division into classes according to their sizes, designed and ordained by the spiritual power of the Creator, supply Nature with all the material atoms required in chemistry and in the physical sciences generally. And their supply is the first physical act of the Supreme Mind which this system indicates in the order of time, as it is also the earliest of His acts placed upon the old record of creation, not yet admitted as evidence in our courts of philosophy, severely logical as they are and ought to be.

167. There are only three kinds of atoms, each kind deriving its nature from its particular volume, namely, the most voluminous which we designate electrical; another class of the smallest volume which is

the matter we call light; and a third class of calorific atoms which are intermediate in volume to the other two; all which we learn by inductive reasoning from premisses derived from observation. These three classes of atoms must be distinguished from the atoms of Dalton's theory of chemistry; Dalton's atoms correspond more with the molecules of which we are about to speak, which we rather compare to the words of a language than to its initial letters; our molecules consist of atoms as masses do of the molecules.

168. Thus is simply and consistently overcome an immense difficulty which the materialistic system of physics has always laid in the way of producing the molecules known practically to chemists; and we are now for the first time already able to say that there is a prospect of deriving them in all their multiform variety with circumstantial explanations of their distinctions from a few minute differences in the sizes of spheres, dispensing with the fanciful geometrical figures that until lately have been imagined to make up the forms of atoms. It need only be here added that without the peculiar feature in the electrical attraction, to which we owe so much, chemistry would still be in want of a satisfactory physical foundation,—of its very alphabet.

Eleventh Section.

Orderly Nature produced by comprehensible means mental from the passive Chaos.

169. As passive matter when at rest has no tendency to enter into motion, or if moving, to assume a state of rest; either condition must be regarded as normal to matter, and would when existing be permanent, so long as the matter should endure, unless terminated by some volition of mind, which is the only kind of power or force in existence; the world having been created by and for mind, and its matter only for mind's temporary animalization, for the furthering of God's designs.

170. Nor to be effective for changing rest into motion, or *vice versâ*, need the volition be an act of that mind which has created the matter; if so be that the Supreme Ruler has in any particular case delegated the power of command to a subordinate mind, through its union with the matter in question by what we know as animality; which is a mysterious combination of two natures, of which the only indication is the voluntary motions of the individual creature formed by the union.

171. Thus matter while universally acted upon directly by the Divine Mind, is to some small extent locally and directly moved by the creature minds to whom He has given the condition of animal existence.

172. But as no creature could add to creation any-

thing new, even if the pristine verities of nature needed to be added to or altered; so man can only will on any of his own material atoms such actions as the Creator has ordained with respect to the corresponding atoms of the universe generally for the production of order out of chaos. The function of the creature volition is restricted to its exercise in the disposal of the matter he commands in conformity to laws over which he has no control; for if he could do anything more than this he would be not only a minister in the physical government of the world, but something also of a lawgiver, performing original functions—executing personal designs for which he has now no commission.

173. For the establishing of order the Creator, as must be conceded, will have used means for the production of ends too simple in their perfection to make a comparison of human artifices at all flattering. To realize this we have only to look around at the heavens, where we see instances of equal forces perpetually and gradually curving two straight lines into the circumference of a circle; and then reflect how imperfectly at best we imitate an effect of the same forces of propulsion and gravity allowed to become both normally passive, set about it as we may by any of the designs of human ingenuity. And this difference will be very far exceeded and our admiration of creative power enhanced as we shall discover by what simple motions among material atoms the physical ends of spiritual means are all achieved. We have but to fall back upon an alphabet composed of fewer

letters than may be counted upon the fingers of a hand to be inducted into that gorgeous language of physical nature which can never have from us its perfect rendering.

174. The Creator exercises for the establishing of orderly nature no command over masses, or even over molecules; His action on matter extending only to the atoms which He has made, each from unsolid space; their motions, chiefly associated in molecules, or masses, being incidental consequences of their propulsion or attraction in one or another direction. By atomic attractions only Nature's Architect achieves all His minute combinations of the Beautiful; and to which language affords nothing worthily comparable except perhaps in some poor measure when a compound german word enlarges itself to embrace an entire phrase, and becomes almost a poem or a picture.

175. All the Divine volitions respecting matter may be resolved into tendencies of those of its atoms which affect each other to mutual approach until distance between them becomes so far annihilated that every atom rests against some other atom or atoms. Those tendencies we may continue to speak of generally as physical attractions; borrowing that name from the *consequences* of force in action, and not from its nature or cause.

176. Attraction, acting only between certain atoms, may cause the reciprocal approximation of the entire molecules to which they belong, or even to whole masses in which they are situate; a result which may

be traced to there being no other attraction reacting sufficiently in an opposite direction; as, for example, when electrical attraction separates a small mass of molecules from a larger mass notwithstanding a lesser reaction of gravity.

177. We have, as already said, only the three classes of archaic atoms, electrical, calorific and luminiferous; each receiving its passive qualification from its distinctive volume; the atoms of each size becoming the objects of special attractions differing in magnitude and direction under the determinations of the Divine Volition; each attraction, whatever be its magnitude, acting through space to all distances according to a common law of intensity, to which we assign a geometrical character, the attraction itself being a spiritual act.

178. The attractions are few in number, and describe by their scientific names their respective functions; each giving motion to a particular kind of matter:—1, gravitation, identified with a minor electrical attraction which causes a tendency to the mutual approach of electrical atoms distributed to molecules universally; 2, an electrical attraction of far greater magnitude, combining atoms of electricity around centres either in space, or, as there is reason to think from their difference of character, solid centres differing in volume for attracting the electrical atoms in unequal numbers, and serving as nuclei to the varied constituents of molecules; 3, a calorific attraction acting to surround each atom of electricity, and probably also each common molecular centre, with atoms of caloric; and 4, a

luminiferous attraction surrounding each atom of caloric with atoms of light.

179. The whole of these four attractions, though acts of volition, are unwavering in their magnitudes under any *given circumstances;* without which, as we may easily understand, there could be no uniformity in nature; but though not arbitrarily wavering there is, as certain circumstances vary, remarkable changes occurring in the magnitudes of the major electrical attraction. We cannot doubt logical induction when its arguments are based on truly observed facts, and the surest and most extensive observation assures us that the number of electrical atoms connected with each molecular centre corresponds with, and is the cause of, its particular chemical equivalent; and also that the force of each particular atom of electricity in that connexion so varies that in order to remove any portion of the equivalent of a molecule the abstracting force must vary in the ratio of the squares of the numbers of the electrical atoms to be removed: the abstracting force and the combining force being in nature one and the same, acting in opposite directions, and either overcoming the other directly it has the smallest excess of force over equality.

180. Under the materialistic theory of causation this observed fact has, since Mr. Cavendish's time in the last century,—in whose practical investigations it was first observed,—been regarded with suspicion for want of conformity to an axiom which, as it stands, illogically insists on comparing unmeasurable causes with

their effects; as well as consecutive effects with one another, and which, as second causes, are both comparable and perfectly measurable and equal.

181. Without the alleged variation in the electrical magnitudes all electrical action remains an enigma; while by adopting it as a true induction from observation, the whole science of electricity becomes mathematically intelligible beyond all precedent. And with causation referred to its proper province of spirituality,—with which it is hardly possible to imagine any one who cares to ascertain for himself the reasonableness of the change to be otherwise than satisfied—it will be found, in making the requisite investigation, that the same variation in electrical magnitudes logically explains certain facts in chemistry that are otherwise quite irreconcilable to the axiom which announces quite truly the equality of secondary causes and their effects in all physical cases.

182. The minor attraction of each electrical atom extends to every other electrical atom in the universe with an intensity varying according to the geometrical law of intensity. Calorific atoms have no attraction for one another, but they are attracted around each electrical atom, and perhaps also around each molecular centre, in indefinite numbers practically combining them the more plentifully as the temperature becomes higher and reaction against the combination less intense. And it is suspected that the attraction of atoms of light by those of caloric is, like the major electrical attraction, definite in quantity under all circumstances.

183. It will now be understood that masses of matter and even its separate molecules are not like atoms entirely solid; because as atoms are all spherical they cannot, of course, have their entire surfaces lying in contact with one another; they only—whatever may be their relative diameters—touch one another at points, leaving interstices of space between them unoccupied by anything of a material nature.

184. This system of physics recognizes, as has been already said, no force of repulsion, the phenomena which have suggested such a force as the readiest way of accounting for certain separations being all explainable on the converse universal principle of attraction, and with a much greater accuracy of detail. It is very palpable that even gravitation must sometimes separate bodies by approximating one or other of them to other bodies in the same line of action but in the opposite direction to the reputed repellancy; and what is thus true of gravitation is also true of the major electrical attraction, as well as of the attraction of caloric for atoms of a different kind.

Twelfth Section.

Conformity of the Intensity of creative action to an abiding Necessity of Geometry.

185. For ages past we have been so accustomed to speak of the causative power, of which we are perpetually conscious in material nature, by the name of

physical force as at length to have effectually fallen into materialism as a profound day-dream; committing in our torpor of reason the solecism of investing inert matter with forces, qualities and properties such as, although not to be understood, quite belie the passivity with which matter is generally credited. And yet the self-deceit continues!

186. And, deceive ourselves as we may on the subject, it is just as palpable that in making these ascriptions to dead matter we are virtually conferring upon it distinctive characters of mind; for nothing but consciousness of position in the first place, and power attendant upon such a consciousness in the second place, would enable a mass of matter to change, at its own instigation, any electrical magnitude, or a lighter for a heavier gravity on finding itself within a shorter distance from any centre of gravitation.

187. Men of science seem seldom troubled with any reflections of this kind while pursuing their search after causation. Nay, with most philosophers intuition secures a tacit acknowledgment that God is First Cause; but it moves them no further than to be satisfied with announcing that particular knowledge as an article of faith, rather than have to admit it as an act of logical discernment under circumstances which in reality causes it to fall nothing short of being conclusive.

188. This introduction of belief in the place of certainty is a great and positive evil in the investigation of truth by logical argument; for, however well-founded it may be, belief necessarily imports into the conclusion

to which it leads a corresponding amount of doubt; perpetuating faith, whereas science inevitably loses its character unless wholly founded on certainty;—such truth as is only *susceptible* of being some day demonstrated not answering the purpose of truth; all truth is demonstrable, but all truth has not yet become knowledge.

189. Whatever be the magnitudes of the several attractions which act upon matter it is an observed fact that they do not act with a constant intensity of force at all distances; and as we cannot impute a difference of intensity to changing relations between the parts of passive matter itself, we must find some other solution of the difficulty of variable intensities that will be satisfactory. Mere enunciation of law is not satisfactory to those who require reason.

190. In objecting to the materialistic view of the physical forces, and in assigning to those forces dissimilar magnitudes and special fields of action, we have already said that—being Volitions of the Divine Mind—the possibility of their operation cannot be in any instance restricted to a finite distance intervening between a centre from which the action emanates, and the point upon which it falls. And we have also referred to the everlasting truths, geometrical and generally mathematical, which, with others of a moral character, have been adopted with the plan of creation into the design of nature.

191. Now we have to indicate that in planning the details for regulating the operation of His own mental

powers upon matter, the Great Architect has embodied in his rule that fundamental law of uncreated geometry which makes the surfaces of all concentric circles to vary as the squares of their distances from the common centre. Speaking physically, any attraction acting uniformly from a centre, and extending to all distances from it in every direction, must divide its own constant magnitude equally over the whole of any spherical surface to which it radiates. Hence the sum total of the magnitude of a force is uniform at all distances; it varies inversely as its distribution; and its power of acting in a line is inversely as that distribution: or, which is the same thing, it varies as the squares of the distances inversely between the centre from which the force operates and the point in any line upon which the action falls.

192. This law of the inverse square of the distance had been, as Whewell informs us, inferred from the observations of the pre-Newtonian astronomers; it is embodied by Newton in his system of gravitation, and again by Coulomb in his experiments for determining the intensities of electrical attraction. But the object at present is to announce it as an universal geometrical law necessarily applicable by reason of their illimitable field and equal diffusion over it, of all the physical attractions, even when apparently limited by their definiteness as is that of the major electrical force, and perhaps also that of the induction of light.

193. These variations with distance, for central force of any kind or magnitude, have always been known as

varying intensities; and as the variations depend on geometrical principles the law of intensity applies to central physical attractions of all kinds: not even excepting what we speak of as chemical affinity, though it be observable only in cases of absolute contact; for the simple reason that affinity changes its name to electrical induction whenever it is observed to be acting at a sensible distance. And here it may be remarked that it is not easy to conceive that any other law of intensity than the geometrical one could have maintained uniform the actions of Deity in second causes throughout the universe of matter.

194. There is however, a seeming exception, but it is only seeming; and it certainly confirms the geometrical law, as well as the doctrine of variable electrical magnitudes—theoretically and practically. It is furnished by compounding the geometrical law with the law of electrical magnitudes. This may be easily understood: successive equal quantities of electricity operating together under given circumstances act with a magnitude which increases as the squares of the quantities in operation; say for 1 and 2 two quantities the magnitudes are as 1 and 4; whereas the intensity of any given magnitude diminishes from 4 to 1 when the distance is doubled. Consequently when the quantities and the distances vary together the TENSIONS of the operative force—that is to say the magnitudes and the intensities multiplied into one another—observe a simple ratio.

195. Without tension, due to the electrical envelope

conceived to surround as with an atmosphere the great centre of gravity of our system—exceptionally extending the reach of electrical attraction—the immense distances intervening between the sun and the planets would reduce the central electrical induction on them to insensibility; whereas as we experience that induction its action is very sensible on the earth and its atmosphere, liberating electricity as the planet turns upon its axis; and, on the same physical principles, must do also as it revolves around the sun; from all which may be circumstantially deduced the diurnal and annual changes both of the earth's electrical equilibrium and in its magnetical condition.

196. If contact does not absolutely annihilate distance between atomic centres, it establishes for any magnitude of force in operation its maximum of intensity. And, contemplating the rapid inverse ratio in which intensity varies with distance, the attractions by which the various atoms of matter would in the absence of reaction be brought together may be figuratively represented as perpetually struggling to cause them to arrive from greater distances through all lesser ones to remain at the least distance possible from a common centre with the final object of rest when motion in the same direction would have become no further possible.

Thirteenth Section.

Places of Atoms and their relations in the formation of Molecules.

197. We have thus arrived at demonstrating that the atoms of matter differ from one another in nothing but in the possession of unequal volumes of solidified space; and that they are as their name—atom implies ultimate constituents of bodies no further susceptible of division; which sets at rest the question of the infinite divisibility of the particles of matter.

198. Atoms need no longer be confounded as at present with molecules. Every molecule, even when simple, consists of all the several kinds of atoms, to wit, electrical, calorific and luminiferous; in addition to its central nucleus, which in one sense is an atom itself, if so be that it may be regarded with truth as a definite volume of solidified space; and so to regard it seems necessary, if for nothing else, in order reasonably to assign to the different varieties of simple molecules their distinguishing equivalents, which otherwise would be arbitrarily assigned; whereas by allotting to the molecular nuclei particular volumes we can logically ascribe to them on the principles of this physical system each a different number of electrical atoms, thus giving it its particular chemical number, or, as it has been called, its atomic weight.

199. The atoms of this system are not to be confounded with the atoms of the chemist Dalton; the

latter, instead of being few in number, correspond rather in multitude with our simple molecules; each of which has a definite, or equivalent, quantity of electricity as the cause of its comparative weight conferred upon it by the gravitating power, or mutual attraction, of the electrical atoms which form the most remarkable and theoretically novel feature in its construction.

200. It is, too, to the electrical equivalents of molecules that we must assign their chemical affinities when in actual contact; for when two molecules are in absolute contact some electrical atoms from each belong to them in common, in virtue of diminished distance and consequent augmentation of the electrical intensity — two hemispheres of different electrical atoms, equal to any whole electrical atom, admitting of being geometrically nearer to the centre of the molecule on either side than can be both the hemispheres of either atom. And the argument applies *a fortiori* when the portions of an electrical atom so attracted in different directions consist of lesser parts.

201. The comparative weights of molecules being denoted by the quantities of electricity normally belonging to them respectively, it follows that electricity must be the only element in nature which is heavy; that is to say, consisting of atoms exerting an attraction for others of their own kind.

202. It would complicate physics for no conceivable good to imagine there can be any second element of matter with atoms impelled towards, or, as we say, made to attract one another, and, at the same time as

must needs be in such a case, associated in definite quantity with each atom of electricity; and in the absence of all such association electricity alone must be acknowledged the sole cause of the gravitation of matter. Caloric and Light are the only other elements available for such an interference with gravity, and whatever affection atoms of caloric may have for matter of other kinds it would be superfluous to entertain the question of their attracting atoms of their own nature. Being, like matter of every sort, not subject to repulsion, Caloric and Light must each of them rank as being simply destitute of all affection whatsoever for its own atoms.

203. Properly to understand physical theory it is very important to have a true view of the natural assemblage of the different kinds of atoms in the simple molecule of matter; and it is conceived that the combining attractions have respectively such magnitudes of force and fields of action that the following effects uniformly result from their operation:—

204. The central basis of each simple molecule of matter attracts around it a quantity of electricity represented by the molecule's equivalent number; each of the electrical atoms being a centre of force attracting around itself an indefinite number of more minute atoms of caloric with an intensity progressively diminishing as the numbers increase by reason of their being localized at a greater distance; and, as a consequence of that lessening calorific intensity, under a corresponding increase of temperature.

205. In its turn each of those calorific atoms acts as a centre of force to a specific number of still smaller atoms of the solid matter of Light, making together a definite complement, or equivalent, of the luminiferous element; the definitely attractive atoms—both electrical and luminiferous — being determined in amount by the particular volume of the central nucleus, directly in the one case while the determination is of course indirect in the other.

206. That the electrical atoms are larger than the calorific seems practically attested by the fact that the latter are capable of passing through the intermolecular channels of material screens which are impenetrable to the former though they are much more forcibly attracted; but it is to be recollected that electricity never passes from one body to another unaccompanied by heat and light, and how the presence of two additional solid matters may affect the question of relative volumes we are not prepared to say. Those two matters have certainly to be taken into account because we can detect caloric whenever we observe passing electricity; and light is the usual concomitant of a concentration of caloric.

207. Perhaps in the present state of that question we cannot proceed beyond a probable conclusion founded on conjecture; but it is an easily conceivable arrangement that the larger spherical atoms should be surrounded by the lesser, rather than that the lesser be separately enveloped by the more voluminous; and at all events if the latter case were the natural forma-

tion the observations of experience just mentioned would not be susceptible of explanation, from which we may infer that the other formation is the true one.

208. Unfortunately, electricity and caloric—whatever may be said of light—are not universally regarded as material substances; and consequently as having an atomic state of existence. The question is an old one, and the view of spiritual causation dismisses it by considering that insomuch as they require interstitial spaces for their passage, they must themselves consist of solidified spheres, which is the only invariable characteristic of matter. The powers of electricity and caloric we are now regarding as motions of particular matters caused by special impulses of the Divinity; though the materialistic school attribute them to forces innate to matter in some especial manner of its own, and, it would seem, as to no matter in particular.

209. After thus distinguishing atoms from the simple molecules formed by the attractions simultaneously operating to draw atoms together, and which attractions are the proper subjects of the sciences of Electricity, Heat and Light; there will still remain, as appertaining more particularly to Chemistry, much that might be said with respect to the combining of molecules, including, first, the compounding of simple molecules, and, secondly, their massification, whether simple or compound; in which it would be quite possible by entering with sufficient minuteness to expose the conditions for those affinities once spoken of under the figure of elective attractions, and for which

elections very satisfactory reasons might be readily assigned.

210. In the assembling together of molecules to form masses, or compounds, we have already indicated the office fulfilled by the geometrical law of intensity, so far as intensity relates to what is called commonly the electrical attraction, and by us the major electrical force; and it may now be remarked of the minor electrical force, that the law of intensity has no application in contributing toward chemical union anything more determinate than a maximum of gravitation, which we express by the word aggregation; absolute contact of the molecular equivalents being the condition which changes the common or major electrical attraction into chemical affinity.

Fourteenth Section.

Physical Induction, its nature and operation on Electricity and probably on Light.

211. The term attraction as used in physical science is expressive of those volitions of the Creative Mind by which the atoms of matter that are appointed to be approached to one another seem themselves to have a tendency to annihilate all intervening distance between them, as conscious beings might do by reciprocal agreement to that effect, and of which the gravitation of electrical atoms toward each other, and the continual pressure of an electrical equivalent around a molecular centre afford ever ready examples.

212. Under certain circumstances attraction so exhibits itself as action at a sensible distance, that we call it induction; though beyond the extraordinary circumstances the difference is in nothing but the name. Indeed induction can most exactly be described as an inevitable result of certain changes in the direction of attraction, effected by varying conditions when, and only when, the force in question is so limited in its action as to draw towards its centre any particular kind of atoms only in definite numbers. According to this definition the force of gravitation is excluded from the possibility of acting by induction; while the force of affinity, equally electrical in its nature, and which we denominate the major electrical attraction, must, by reason of the definiteness of the number of electrical atoms attracted as an equivalent around each molecular centre, establish induction either from molecule to molecule if they be in contact, or across any distance in space by which they may be separated, however great the separation may be, simply because attraction is more forcible at a shorter distance.

213. Thus induction, as a consequence of the definiteness of electrical attraction, has consequences readily intelligible; for whenever the central nucleus of a molecule attracts a given number of atoms of a given kind for its constant equivalent, its ceasing to attract any one of the number however far distantly removed, is an impossibility in nature. In this conclusion we are supposing the magnitude of force to be constant for the sake of putting it out of question, in

order that the law of intensity alone may be implicated; which, as we have before shown, will make the force at all distances to be inversely as its geometrical diffusion, or, as it is more commonly spoken of, as the inverse square of the distance. If then it were left to the rapidly diminishing intensity of force with increasing distance, induction would soon become insensible, even in the case of the sun's electrical action on the earth now made manifest to us only by virtue of the law of electrical magnitudes, which causes the force to start from the sun great beyond all conception, and to act with a corresponding effect or tension on any distant mass of molecules on which the induction may have to fall.

214. We shall understand this when we compound together the laws of geometrical diffusion and electrical magnitude in their application to this case; for then in place simply of intensity we shall have a tension which logical deduction, taking the sun's electrical atmosphere into consideration, will show to be enormously great, whatever the distances through which the induction may pass in arriving from the centre of the solar system to the planets revolving around it; while all of them, being thereby made plus electrical, must in their turn act inductively upon other material objects more distant from the sun than themselves, thus causing the sun's direct electrical action upon them to vary continually with their relative positions and consequent capacities for electrical inductions.

215. Thus much respecting the influence of the sun's superabounding electricity, of the existence of which we shall be unable to remain in doubt after applying to the investigation of the historical facts of electrical science the statical principles we are putting forward for their elucidation as part and parcel of that truth which material nature is disclosing to our observation. But, besides applying to electricity, it has become to the writer almost beyond a question that the principle of physical induction will soon find its direct application in an analogous manner to the matter of Light elucidating the phenomena which characterize the attraction of Light for caloric, and, consequently, implicating all the kinds of matter with which caloric exists in combination. The local presence of Light at a distance from all its known or alleged sources has suggested its Inductive action across intervening space; and an inquiry into the subject is made particularly desirable by the fact that the present theories of Light become thoroughly unsatisfactory under the view we have now been taking of space without anything material generally diffused in it for the propagation of action—chemical as it is supposed to be, and which as such depends on the contiguity, or even perfect juxta-position, of molecules.

216. Before dismissing the subject of Physical Induction, and concluding the spiritual system of physics which introduced it, it may be explained that science has sustained a great hindrance by its tardiness in discovering the nature of induction in the case of electri-

city; and will probably have the hindrance repeated in the case of Light, unless its professors profit by their former unfortunate limitation of the field of physical force, and enter upon the investigation of cause with their minds less closed by prejudice against the entrance of evidences based upon its spiritual nature.

217. The physical attractions which the Divine Creator is causing to act between the atoms of matter must be either universal in their comprehensiveness, like that of the electrical atoms for one another,—and by which any one electrical atom attracts every other electrical atom in the universe,—or they must act to combine only definite numbers of the atoms they affect, as is the case when molecular centres attract atoms of electricity, the attraction of each centre then extending only to some particular number of them which is equivalent to itself; leaving all the rest of the electrical atoms to which that centre is indifferent to obey their own electrical attractions, their gravitations for one another, and also the attractions which surround each of them with atoms of Caloric and Light.

218. None but attractions, therefore, which are definitely limited in their appropriations of atoms can act inductively; but, on the other hand, no centre of force that can act by induction can be supposed not to attract every atom of its equivalent with the intensity due to the law of distance, though one of the atoms should be existing millions of miles away; the consequence of which is, as we may easily understand by

taking into consideration the law of intensity, that, in the case say of a molecular centre and its equivalent of electricity, whatever be the intensity with which the molecule is attracting any portion of its equivalent, if any quantity of electricity equal to that portion be intruded nearer than itself to the molecule, the intruded electricity will become appropriated by it in virtue of position; and the electricity previously belonging to it be thereby set free to act by Induction on whatever other molecular centre shall happen to be the most contiguous to it; the question of appropriation being always determined in favour of the highest intensity, or in other words the greatest proximity.

219. Here we have a second instance of the overleaping of distance by attraction, the first example occurring in the case of gravitation observable throughout the whole space occupied by the planetary system; and these instances are not to be ignored without giving preference to the hypothetical allegation that matter is necessary for the conveyance of force; but that mode of negativing the observations of fact is incompatible with the attributes of spiritual causation which cannot be confined in its operation to a limited field whether the attraction be definite or universal—whether it be called attraction or induction.

220. And the evidence which testifies in the case of Induction has this further advantage attending it: we have suffered the evidence of the projection of force in the case of gravitation to lie by and be lost as it were by default of closing with its offer of proof; an error we

shall not commit in the case of electrical induction, as the fundamental principle upon which it is based has already explained that the major electrical attraction must be able to act at sensible distances without the intervention of any matter.

221. As the planets and their satellites roll in empty space as comparatively small things before the sun, its atmosphere of electricity—and of Light too if the theory of its definite attraction rest on truth—launches its Induction through spacial nothingness upon their presented portions of surface respectively with Tensions the magnitudes of which are as the squares of their differences also, reduced according to the geometrical law of distance. But in the electrical observations which we make, the earth's atmosphere has to be considered, as its influence is nowhere absent. From the earth away from the sun induction is unceasingly propagated, through contiguous molecules of air; the action becoming so rapidly less as the distance increases as to be speedily reduced to insensibility: indicating a decline which even the law of intensity cannot account for, until we bring to its aid the law of magnitudes, which by successive divisions of the induction on the molecules of air would reduce the action at each duplication of the distance—not from unity to a fourth part of one, as when due only to intensity—but from one to the sixteenth part of unity, due at once to intensity and reduced magnitudes on the sole supposition that the geometrical distribution of the inductive action was under the circumstances fully possible.

INDEX.

PAR.

Abuse of deduction . 60, 61
Accelerating and retarding attractions . . . 136, 137
Action and reaction . 69, 70
——— on atoms through space to all distances . . . 177
Admission of truth more common than its perception . 187
Affinity: a form of electrical induction 193
——— how caused . . 200
All creative means simple . 173
Animal mind responsible for delegated power over its associated matter . . 44, 76
Appetites facts of observation mentally perceived . . 38
Arguments *à posteriori* or *à priori* 58
Arrangements of the atoms of electricity, caloric and light around one another . . 7, 8
Arrestation and control of motion 68
As an animal mind commands its associated matter so the Creator directs the whole matter of the universe . 154
Assumption of a Creator . 19, 87
Attraction: meaning of the term 4
——————— its field of action unlimited . . . 123, 124
——————— of atoms moves molecules and masses . 176
——————— not conveyed but projected 219
Attractions: their peculiarities 182
——————— representing creative mental action only four in number . . . 178

PAR.

Attractions: limited or unlimited 217
Atoms and molecules: their respective volumes . . 18
——— supply science with all its physical requirements 166, 167
——— in contact only at points of their spherical surfaces 175
——— only few in kind . 199
——— mechanically sifted 206, 207

Brute animals responsible physically for their acts . 151

Caloric an archaic element of matter 7
Cause not excluded by absence of matter . . . 41
——— measured only by its consequence . . . 59
——— a logical key to effect 86
Causative energy as a whole not 'conserved' . . 29
——— equal to magnitude multiplied into intensity . 26
——— action anticipatory of its effect 141
Cavendish's original experiment relating to variable magnitudes . . . 47
Central forces: each of their intensities geometrical conserved . . . 17, 29
Chaotic matter only voluminous and solid . . . 1, 2
Composition of the law of intensities with the law of electrical magnitudes . 52

PAR.
Comprehensiveness of natural philosophy . . . 56, 58
Compound molecules and massification 209
Connexion of *Mentalism* with the Darwinian doctrines . 12
Consecutive effects of second causes not always equal 15, 12
Conditions though essential not causes . . . 30
Controul and arrestation of motion 68
Conventionalities of nomenclature 66
Construction of molecules comprehensible 168, 203, 204, 205
Correlation of forces in its generality incompatible with mental causation . . 85
Coulomb's law of the inverse square of the distance . 45
——— geometrical . 60
Creation and nature: their distinction . . . 11, 12
——— not complex . 21, 22
——— of force superfluous 156
Creation's antecedents . . 58
Created mind powerful to change the normal conditions of matter . . 170, 171
Creative mental power an induction from observation 88
Creature Mind not creative but administrative . . . 22

Dead force in matter insufficient 157
Deduction implies previous induction 65
——— and induction both sometimes demonstrative 59, 62
——— not to be mistaken for demonstration . . 60
Demonstration an intuitive perception 59
Deity in absolute command of universal matter . . 149
——— personal: not an abstraction . . . 158, 159
Desire of knowledge universal 100
Direction and velocity of motion the physical alphabet . 78

PAR.
Discovery of physical induction renews a lost opportunity 220

Effects directly or indirectly measured by space . . 59
——— of cause modified by creature mind . . . 75
——— second causes not to be recalled but compensated 152
Electricity one of the three archaic elements of matter 7
——— combined in definite equivalents with molecules 8
——— susceptible of accurate divisions into equal parts . 47
——— and caloric solidified spheres of space . . 208
Electrical equivalents the cause of gravitation . 8, 18
——— tension compounded of intensity and magnitude 52, 194
——— attraction becomes affinity by contact of molecules 210
——— attraction: a physical induction . . . 212, 218
——— induction by the sun . 221
Elements of creation nothing and mind 79
Emanation of light needless 125, 126
Eternity a line of time without terminations . . . 138
Experience 102
Extension without substance . 127

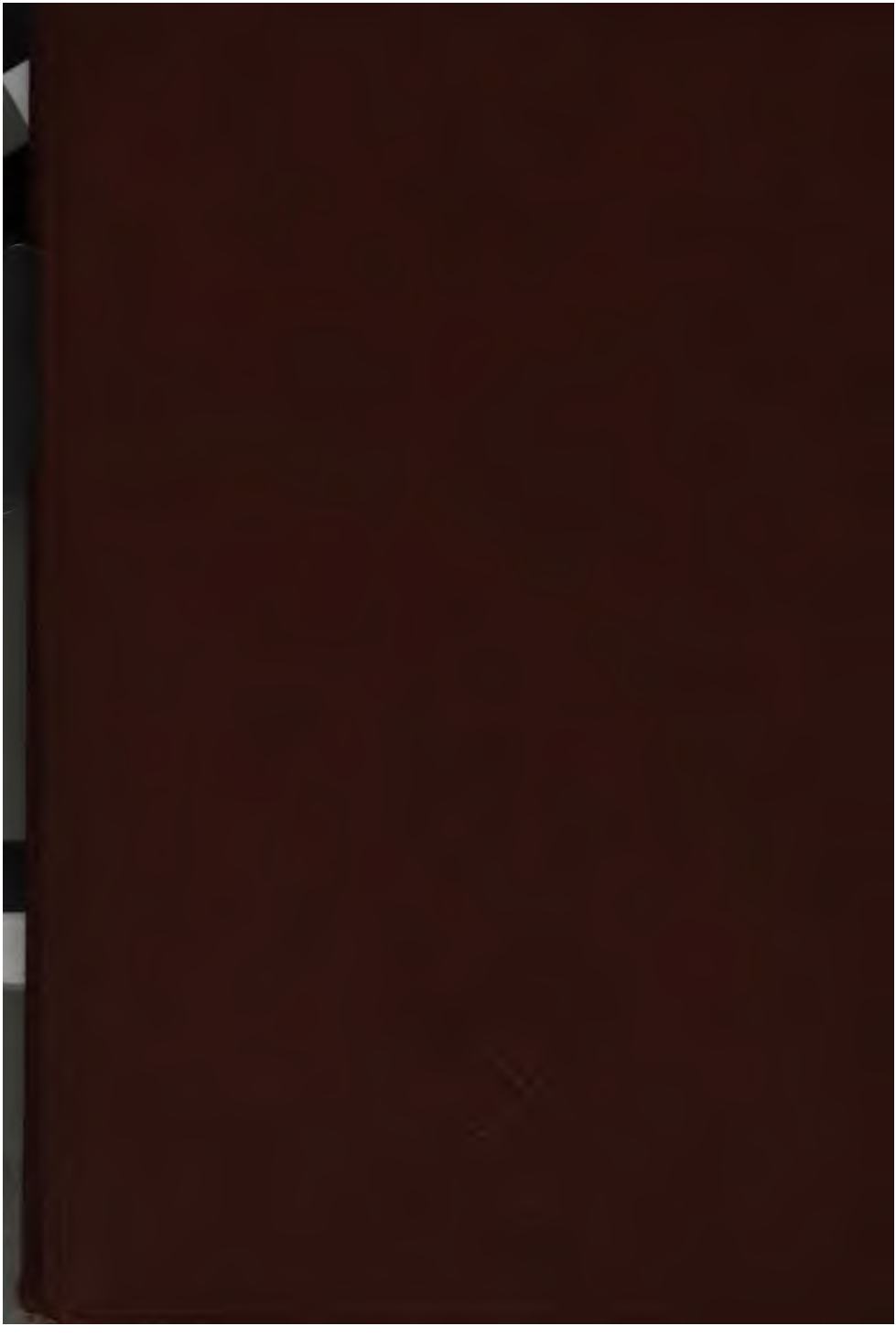
Facts and Intuitions . . 35
——— of observation untruly reported to the mind by abnormal senses or from insufficient observation . . 64
Faults in the use of logical induction and deduction 35, 37
Falling bodies by central attractions 148
Faith not to be substituted for knowledge in science . . 188
First admittance of materialistic error . . . 40, 41
——— or mental cause unmeasureable 71
——— experimental indications of governing mind 42, 43

PAR.
Fixed causation for variety in product 12
Foundations of the world . 59
Force not conducted but projected 126
——— of repulsion repudiated 135
——— ruling in nature must be conscious . . . 154, 155
——— physical in effect, mental in causation . . . 23
Formation of atoms . 164, 165

Harris' experiments in relation to variable electrical magnitudes 45, 46

Idio-attraction of electricity the cause of weight . 201, 202
Ignorance of physical induction a bane to science . . 216
In the administration of nature animals are functionaries 89, 90
Inconsistencies of materialism 93, 94
Induction as affected by tension 214
Inertia: its cause . . . 68
Importance of metaphysical knowledge 106
Insufficiency of language for scientific distinctions . 95, 96
Isolated mind not known to human experience . . 91
Intuition: gratuitous teaching 58, 59
Investigation, inductive or deductive 58

Law of electrical magnitude 49, 50, 51
Laws of nature defined . . 31
Length, breadth, and thickness as measures . 129, 130
Life: its alleged materialistic origin 81
——— spiritualistic definition 84
——— confounded with vegetation 82
Light one of the three archaic elements of matter . . 8
Luminous emanation unnecessary 125, 126

Magnetism an effect of the sun's electrical tension . 195

PAR.
Major and minor electrical forces 9
——— electrical force changes its magnitudes . . 9, 10
Man a minister in the government of matter 172
Matter produced from nothing by mind 1, 2
——— apart from mind still nothing 3
——— unserviceable to materialism 3
——— not necessary for transmitting action . . . 28
——— not actively causative 91
——— in relation to its mental cause still metaphysical 111, 112
——— susceptible of destruction by its Creator . . 114
——— in gravitating only in passive submission to force 144
——— wholly controuled through its atoms . . 174
——— not infinitely divisible 197
Mathematical errors by default of vigilance . . 64, 65
Measures all derived from space . . 67, 128, 142
———of length, area, volume, weight and duration . . 131
Mental cause not comparable with its effect . . . 97
Metaphysical things prerequisites for creation . 107, 108
Mind eternal in duration . 67
——— and matter in communion is animal life . . 83
——— its mode of working on matter inconceivable . . 110
——— has no exclusive occupation of space . . . 127
Molecular weights multiplied into gaseous specific heats a constant quantity . . 18
———centres to be regarded as solidified spaces . . 198
Molecules and masses not entirely solid 183
Motion and rest normal conditions of matter . . . 169